



## MONITOR // TECHNICAL PROCEDURES

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## Monitor // Technical Procedures

### Section 1

#### General

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## GENERAL INFORMATION

The Monitor // is a 12-inch CRT display monitor to be used with Apple //e or Apple II Personal Computers. The screen tilts up or down to help reduce screen glare, and there is a built-in handle for easy carrying. The power switch is on the upper right corner of the unit and will stay depressed when the unit is on. Behind the power button is a green LED that lights up when the power is on.

The only adjustment on the front of the unit is the **contrast** control which is along the right edge of the unit. The other external controls are on the back side of the unit. They include a **brightness** control; a **vertical hold**; and a **vertical size**, which lengthens or shortens the vertical height of the picture.

Internal to the unit are a **horizontal width**; a **horizontal linearity**, which assures the characters are of uniform width on both sides of the screen; and a **horizontal hold** to control horizontal rolling or tearing on the screen. There also is a **vertical linearity** to assure that the top and bottom characters are the same size, and a **focus**, used to maintain the best overall image on the screen. The internal controls are mainly used for servicing adjustments, which are discussed later in this procedure.

The adjustment section is written to be used with either the Monitor test pattern diskette (part # 686-0026) or the Apple //e ROM diagnostic card (part #661-94086) which generate test patterns for the adjustments.



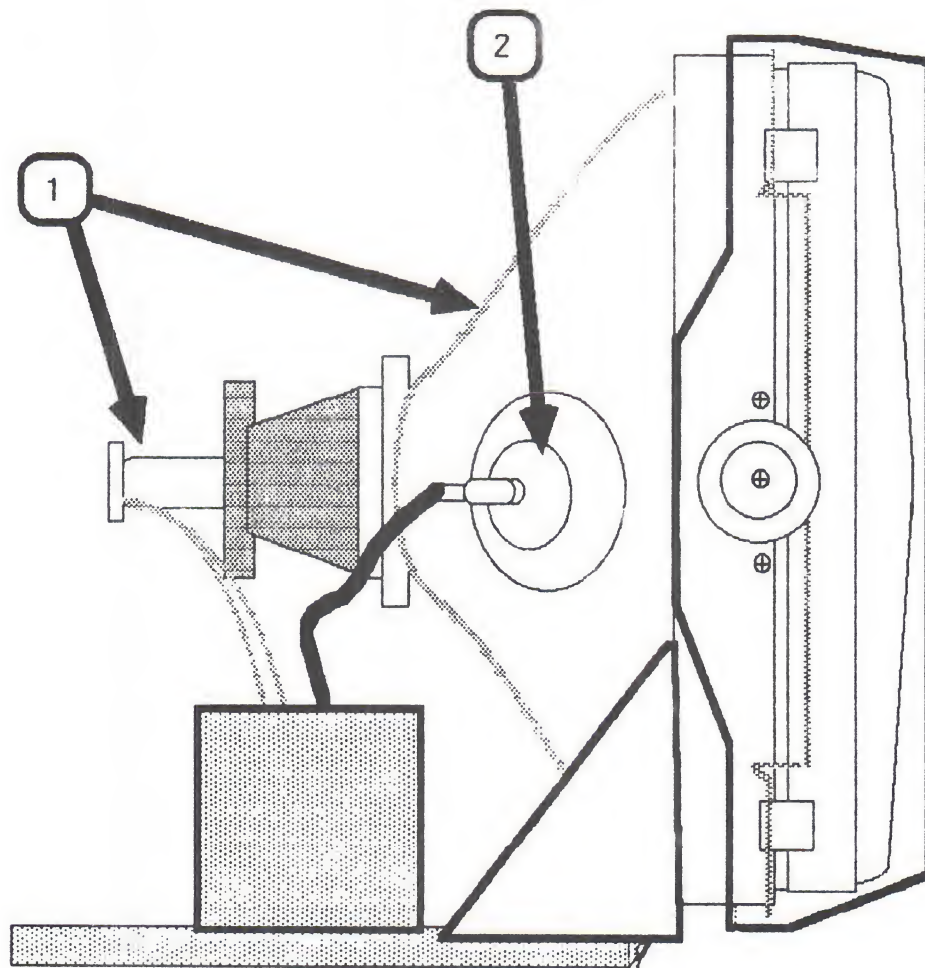


## SETUP PROCEDURES

To set up the Monitor // for use with the Apple //e or Apple ][, do the following:

1. Connect one end of the video cable phono plug to the phono jack on the back of the Monitor. Connect the other end to the Apple video output phono jack. (It doesn't matter which end of the cable you use; both are the same.)
2. Plug the power cable into a three-hole grounded wall socket.
3. Switch on the Monitor and write some text on the computer.
4. Turn the contrast control clockwise to its maximum. (The contrast control is located on the right front edge of the Monitor.)
5. Turn the brightness control on the rear of the monitor clockwise (facing the rear of the Monitor) until the fine lines that form the background of the display are clearly visible.
6. Turn the brightness control counter-clockwise until the fine lines of the background are just extinguished.
7. Adjust the contrast control to give a pleasing level of text illumination.
8. Adjust the tilting screen so that it is perpendicular to your line of vision.

**CAUTION: THIS EQUIPMENT IS INTENDED TO BE ELECTRICALLY GROUNDED. This product is equipped with a three-wire grounding plug (a plug having a third pin). This plug will fit only into a grounding AC outlet. THIS IS A SAFETY FEATURE.**



**FIGURE 1**





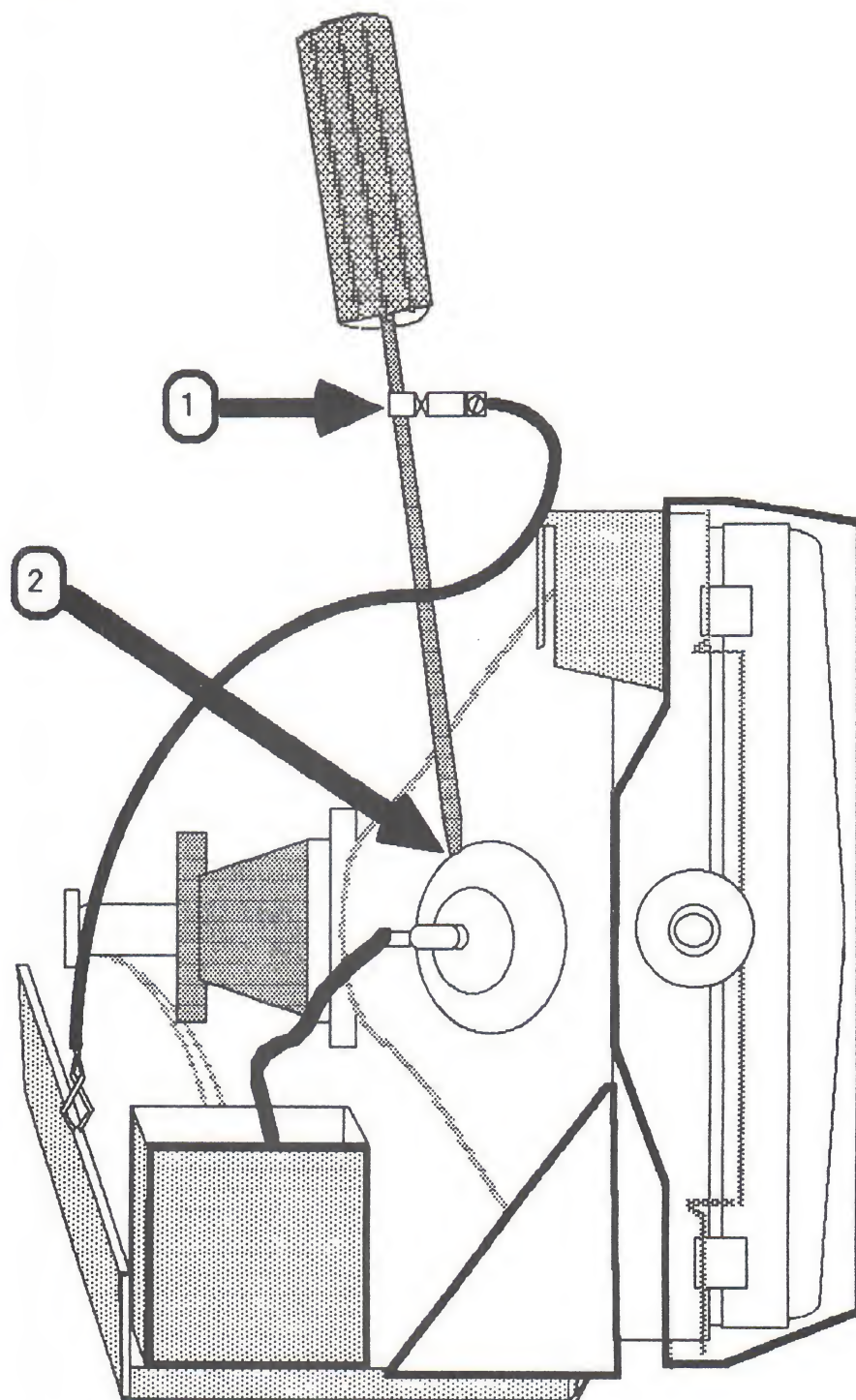
## **SAFETY PRECAUTIONS**

Review and memorize the safety rules listed below before working on the monitor.

1. **ALWAYS REMOVE THE AC POWER CORD BEFORE WORKING INSIDE THE MONITOR //**.
2. **ALWAYS DISCHARGE THE CATHODE-RAY TUBE (CRT) (Figure 1, #1) BEFORE REMOVING OR REPLACING ANY INTERNAL PARTS.** The Cathode-Ray Tube in the Monitor // is an extremely dangerous piece of equipment. It runs at 12,000 volts DC and contains a high vacuum. Before touching any internal components you must discharge the CRT.

**NOTE:** See page 1.9 for CRT discharging procedures.

3. **ALWAYS WEAR SAFETY GOGGLES WHEN WORKING WITH A CRT.** Aside from electric shock, the most serious danger in working with CRTs is that you may break the tube and cause it to implode. Since the tube contains a high vacuum, a break can cause the tube to collapse into itself violently, then explode. This will not always happen when the tube is broken, but it is always possible, and you must be prepared for the worst case.
4. **NEVER SUBJECT THE TUBE TO MORE THAN MODERATE PRESSURE, AND NEVER HANDLE A TUBE BY ITS NECK.** To prevent an implosion, you should take every precaution against breaking the tube, especially at the neck, where the tube is the thinnest.
5. **ALWAYS REMOVE ALL RINGS, WRISTWATCHES, BRACELETS, ETC., BEFORE WORKING INSIDE THE MONITOR.** Metal jewelry is an excellent conductor of electricity. Removing jewelry will reduce the possibility of electric shock.
6. **NEVER TOUCH THE ANODE** Normally the anode has a connector (Figure 1, #2) plugged into it, but when a CRT is replaced, this connector is removed, exposing the anode. The anode can maintain a charge of several thousand volts (even after the power is off).
7. **KEEP ONE HAND IN YOUR POCKET OR BEHIND YOUR BACK WHEN ADJUSTING OR DISCHARGING A LIVE CRT.** This reduces the risk of lethal injury should you accidentally contact high voltage.



**FIGURE 2**





## DISCHARGING THE CRT

1. Turn off the monitor.
2. Disconnect the AC power cord.
3. Remove the back cover as described in the Take-Apart section.
4. Position the monitor so that the back is facing you.
5. Remove any rings, wristwatches, and bracelets.
6. Put on safety goggles.
7. Attach one end of an alligator lead to a long flatblade screwdriver, two inches from the insulated handle. Attach the other end to any part of the metal chassis surrounding the CRT. (Figure 2, #1).

**WARNING: USE ONLY ONE HAND WHILE DISCHARGING THE CRT. Grasp only the insulated handle of the screwdriver while discharging the CRT.**

8. Slide the screwdriver under the CRT anode cap (Figure 2, #2) and push it towards the center of the cap until the blade comes into contact with the metal anode ring.

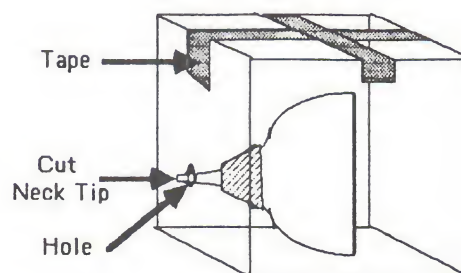


## DISPOSING OF THE CATHODE-RAY TUBE (CRT)

Since the CRT contains a high vacuum, a break can cause the tube to collapse into itself violently, and then explode. So, before you dispose of a defunct CRT, it must be devacuumed. The procedures for devacuuming the Monitor // CRT are as follows:

1. Locate a thick cardboard box large enough to completely conceal the CRT.
2. Cut or drill a hole in the side of the box, just large enough to insert the very tip of the CRT neck through. The hole should be about six inches from the bottom.
3. Put on a pair of safety goggles
4. Carefully place the CRT inside the box with the tip of the neck protruding through the hole and tape the box flaps down with a strong tape, preferably duct tape. (See diagram below.)

**WARNING: ONLY THE VERY TIP OF THE CRT NECK SHOULD BE PROTRUDING THROUGH THE HOLE IN THE BOX. THE BOX MUST NOT HAVE ANY OTHER OPENINGS!**



5. Standing to one side, use a pair of diagonal cutters to snip off the very tip of the CRT neck protruding through the hole.

**WARNING: DO NOT LOOK DIRECTLY AT THE BOX WHEN SNIPPING OFF THE NECK TIP!**

You will hear a prolonged sound of air entering the tube (psssssssss...). The CRT is now devacuumed.



## MONITOR // TECHNICAL PROCEDURES

### SECTION 2

#### TAKE-APART

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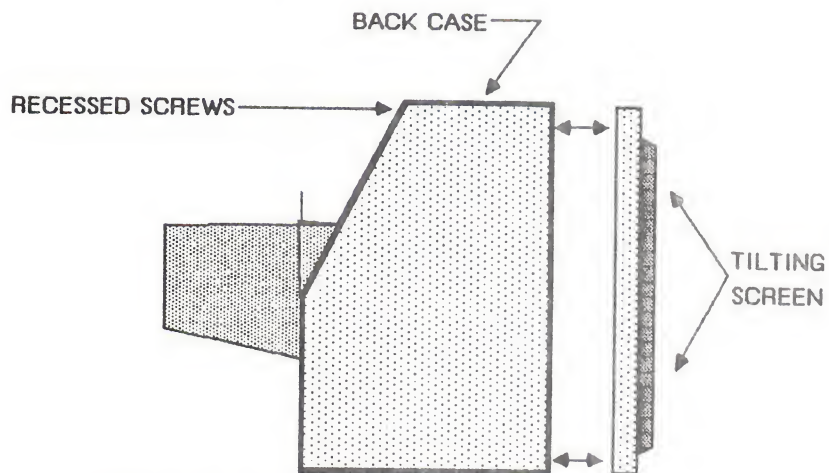


## INTRODUCTION

This section covers the take-apart procedures for the Monitor // . Below is a list of materials used for the procedures.

Monitor //  
Medium Phillips screwdriver  
Diagonal cutters  
Phillips screwdriver (magnetic)  
12 in. jumper wire (with insulated alligator clips)  
Small flatblade screwdriver  
Medium long nose pliers  
X-acto knife





LEFT SIDE VIEW

FIGURE 1

FILTER BOARD

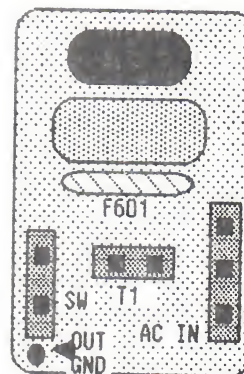


FIGURE 2

TOP VIEW

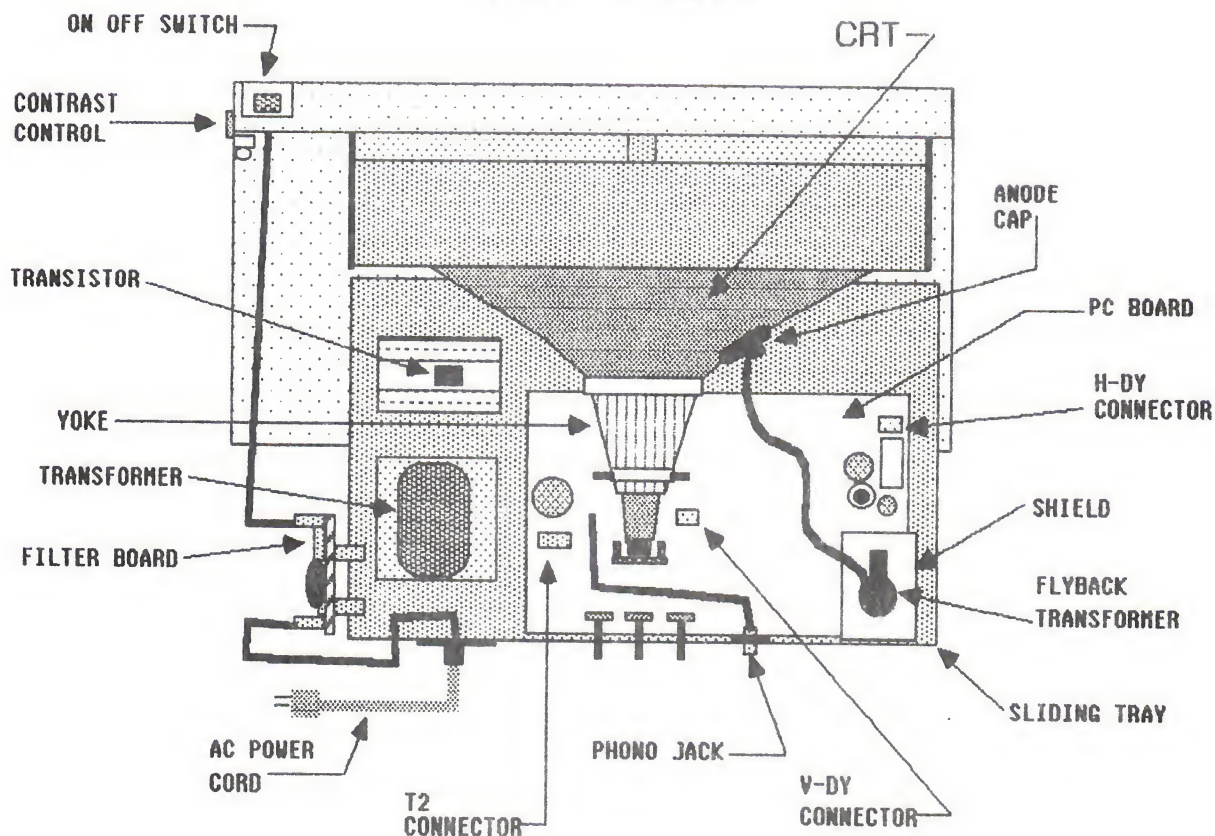


FIGURE 3





## BACK CASE REMOVAL

1. Disconnect the AC cord from the wall outlet.
2. Place the Monitor on its left side (while facing the front) and remove the (4) four phillips head screws from the bottom.
3. Set the Monitor back on its feet, facing away from you and remove the (2) two screws, located in the top back side of the case, in the handle recess (see Figure 1.1).
4. Slide the back case to the rear and away from the Monitor (see Figure 1.2). Pull the power cord through the opening in the back case.

**NOTE:** On some early production Monitors the molded plug on the power cord is too large to fit through the opening in the back case. If this is the case, proceed with step 4; otherwise skip to step 5.

5. The power cord can be removed by disconnecting the plug at AC IN on the small filter pcb (see Figure 2.1) and desoldering the green ground wire. Remove the (2) two screws from the plastic cord mounting plate at the rear of the chassis (see Figure 3.1), remove the tie wrap, and withdraw the wires through the hole in the chassis.
6. To reinstall the back case and power cord, follow the procedure described above in reverse order.

# TOP VIEW

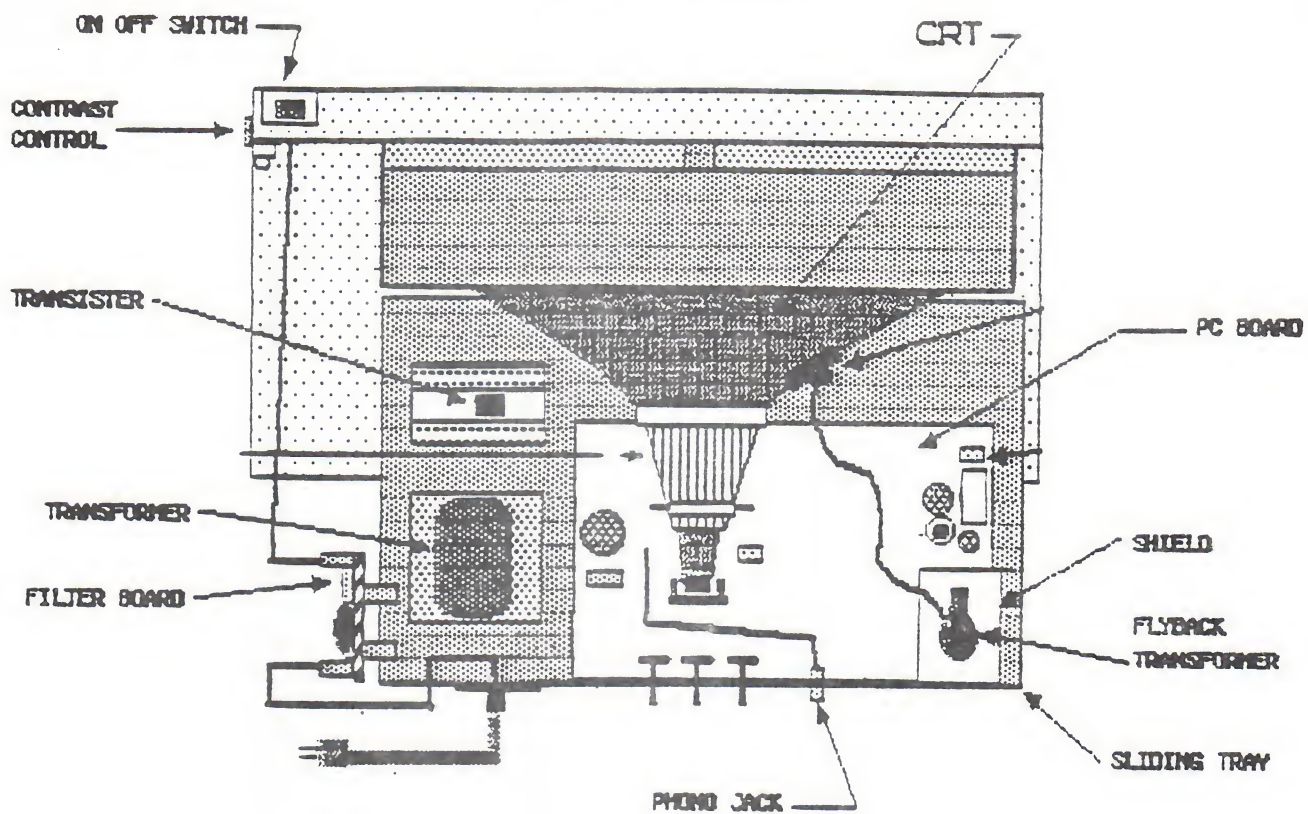


Figure 3

## FILTER BOARD

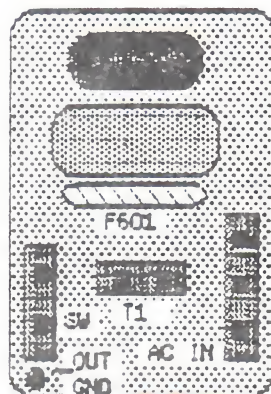


Figure 2



## FILTER BOARD AND FUSE REMOVAL

The filter board is located along the left rear side (facing the back of the unit) of the chassis (see Figure 3). To check the fuse or remove the filter board do the following:

**Before starting, make sure the power cord is unplugged.**

1. Remove the back case (see Back Case removal procedure).
2. Remove the three plugs from the filter board, AC IN, T1 and SW (see Figure 2).
3. Remove the phillips head bolt that holds the board to the chassis. (Hold the nut on the back side of the bolt with the long nose pliers.)
4. If you are changing the filter board then you will have to unsolder the green ground wire to release the board completely. If you are only changing the fuse the ground wire does not have to be removed.
5. If the fuse is open (the wire inside is broken), change it by unsoldering both ends of the fuse wires from the board and lift the fuse from the board (this type of fuse is called a pig tail fuse).

**NOTE:** It is easier to unsolder if you use a solder sucker to remove the excess solder and some kind of holder (vice grips) to hold the board while you're working on it.

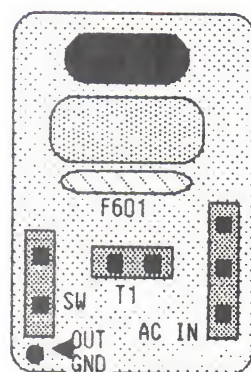
6. Replacement of the fuse is just a matter of putting the correct fuse (for a 115V unit, use a .5 amp fuse, for a 230V unit, use a 1 amp slow blow fuse) into the wire holes and resoldering the leads. Clip off any excess from the leads after soldering.

**NOTE:** Newer models of the Monitor II will have clip in fuse holders and will not require unsoldering or removal of the filter board to change the fuse.

7. To replace the filter board with a new one do the following:
  - a) Solder the green ground wire to the filter board where it is marked 'Ground Out.'

Continued on next page

## FILTER BOARD







- b) Remount the filter board to the chassis bracket using the phillips bolt.
- c) Plug in the three plugs SW, T1, and AC IN. Be careful with SW and T1 -- both are two prong plugs and can be put on the wrong posts. T1 comes from the transformer and SW comes from the Power Switch.

**IMPORTANT:** T1 can also be put on backwards: the black lead should go on the left and the white lead should go on the right as you face the board. The board is marked B and W for this plug.

# TOP VIEW

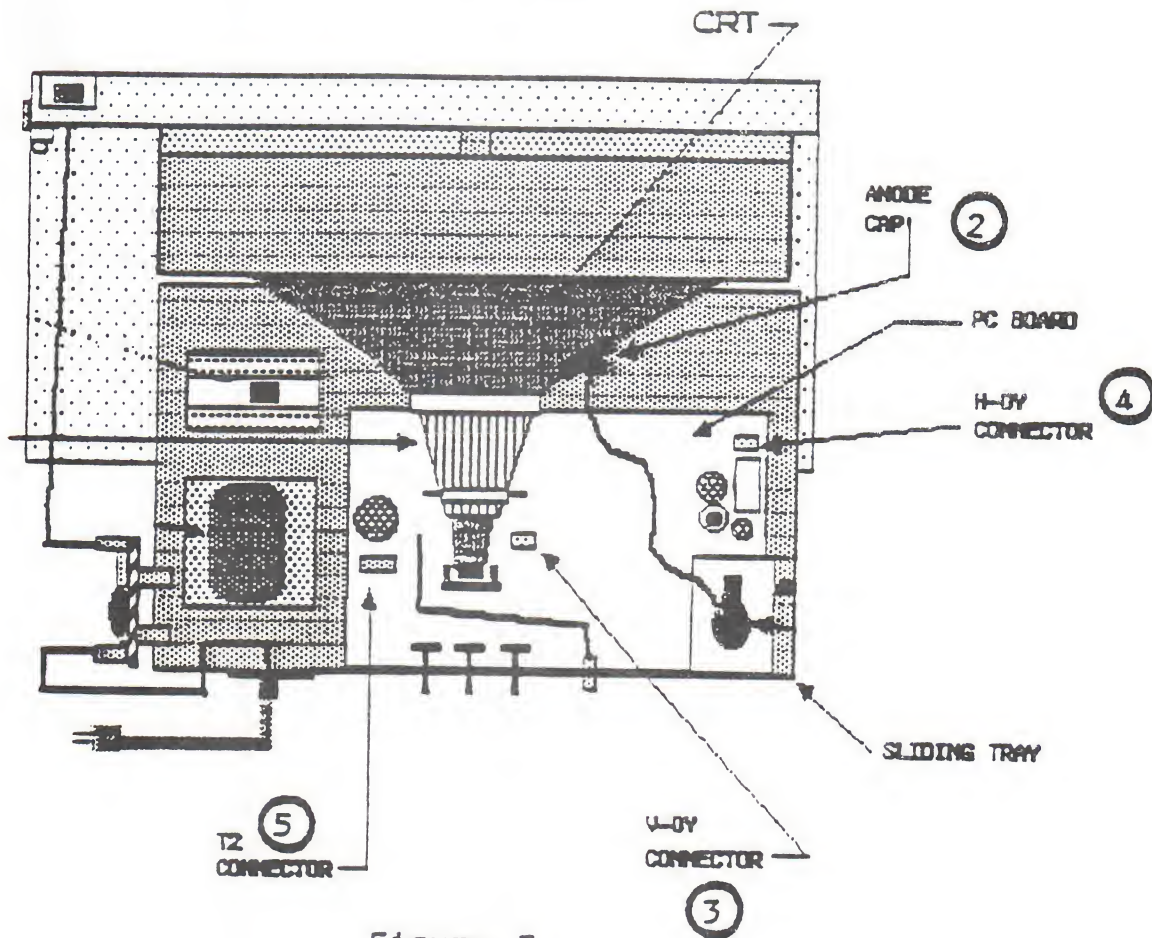


Figure 3





## PCB (Printed Circuit Board) REMOVAL

### CAUTION

ALWAYS REMOVE POWER FROM THE MONITOR // AND DISCHARGE THE CRT ANODE BEFORE FOLLOWING THESE PROCEDURES. A STATIC CHARGE MAY STILL BE PRESENT ON THE HIGH VOLTAGE ANODE, EVEN AFTER POWER IS REMOVED. TO PROTECT YOURSELF FROM INJURY, ALWAYS DISCHARGE THE HIGH VOLTAGE ANODE BEFORE ATTEMPTING TO DISCONNECT IT FROM THE CRT.

1. Remove the back case (see Back Case Removal procedures).
2. DISCHARGE THE HIGH VOLTAGE ANODE. This is accomplished by connecting one clip of the jumper wire to the metal chassis and the other clip to the flatblade screwdriver. Then slide the screwdriver under the rubber cup (anode cap) on the side of the CRT until it contacts the metal clip (see Figure 3.2). The anode wire can now be removed by squeezing the clip on the end of the wire.
3. Remove the anode wire by peeling back the rubber cup, using long nose pliers to squeeze the metal clip together, and pulling it out.

**NOTE:** Before doing the following steps, pull the chassis tray toward the back of the unit. The components are more accessible with the chassis pulled back as far as the wires allow.

4. Disconnect the two (2) pairs of wires going from the yoke to the PCB. The green/white is connected at V-DY in the center of the board (see Figure 3.3), and the brown/gray at H-DY located on the front right corner of the board (see Figure 3.4). Cut all the tie wraps along these wires.
5. Remove the black ground wire going from the PCB to the mounting tab at the upper right corner of the CRT, by removing the screw in the tab.
6. Disconnect the transformer secondary wires (2 red) at location T2 near the left rear edge of the PCB (see Figure 3.5).

Continued on next page

# FILTER BOARD

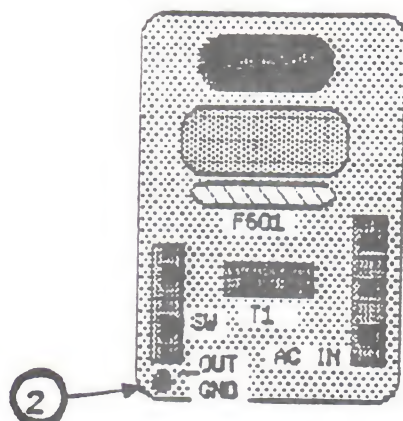


Figure 2

## TOP VIEW

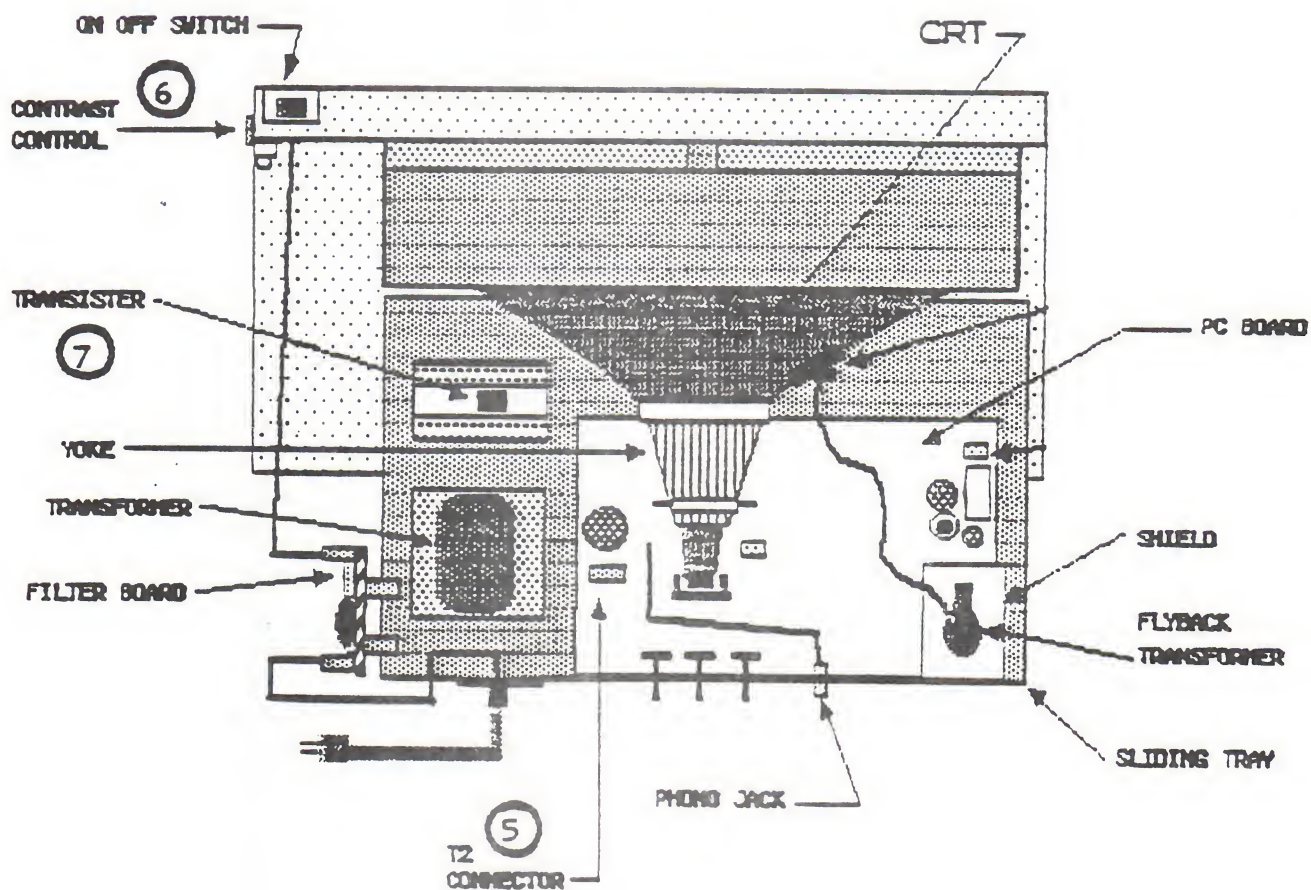


Figure 3



7. Unsolder the green ground wire from the small filter PCB at OUT/GND (see Figure 2.2).

**NOTE:** It might be easier if you remove the filter board from the chassis to get at the solder on the back side.

8. Remove the one LED mounting screw and the two (2) Contrast Control mounting screws located along the left front case (see Figure 3.6). These two parts will remain attached to the PCB. Cut all tie wraps along these wires.
10. Disconnect the three (3) wire connector from the transistor in front of the transformer (see Figure 3.7).
11. Disconnect the socket on the end of the CRT.
12. Remove the two screws that attach the RCA phono jack to the chassis.
13. Remove the five (5) mounting screws from the PCB.

**NOTE:** The mounting screw at the right rear of the PCB also holds the flyback transformer shield, and glue has been used to strengthen the connection between this corner of the PCB and the undermounting. After removing the screw, remove the transformer shield, then loosen the glue under the corner of the PCB by sliding an X-acto knife between the PCB and the undermounting. **Any attempt to lift the PCB before the glue has been loosened will result in a broken corner, rendering the PCB worthless.**

14. The PCB can now be removed by sliding it forward 1 inch (allowing the knobs to clear the chassis) and lifting up.

#### INSTALLING THE PCB

1. Mount the PCB on the sliding chassis, making sure the three stems from the pots fit through the holes in the chassis. Secure the board with the five screws. Make sure that the shield is mounted around the flyback transformer with the mounting screw at the right rear of the PCB.
2. Replace the phono jack.
3. Replace the CRT socket.
4. Connect the 3-wire connector to the transistor.
5. Reconnect the LED and the Contrast Control on the front case.





6. Solder the green ground wire from the PCB to the filter board. (If you had removed the filter board, remount it at this time and connect any wires that had been removed.)
7. Connect the 2 red leads from the transformer to connector T2 on the PCB.
8. Connect the black ground lead from the PCB to the upper right corner of the CRT mounting screw.
9. Connect the (2) pairs of wires from the yoke to the PCB. The green/white wire connects to the V-DY connector, and the brown/gray wire to the H-DY connector.
10. Reconnect the Anode cap to the anode of the CRT, making sure that both metal clips are in correctly.

**NOTE:** When a new PCB board is installed, it is possible that the horizontal or vertical circuits will need adjustment. See the PCB adjustment.

# TOP VIEW

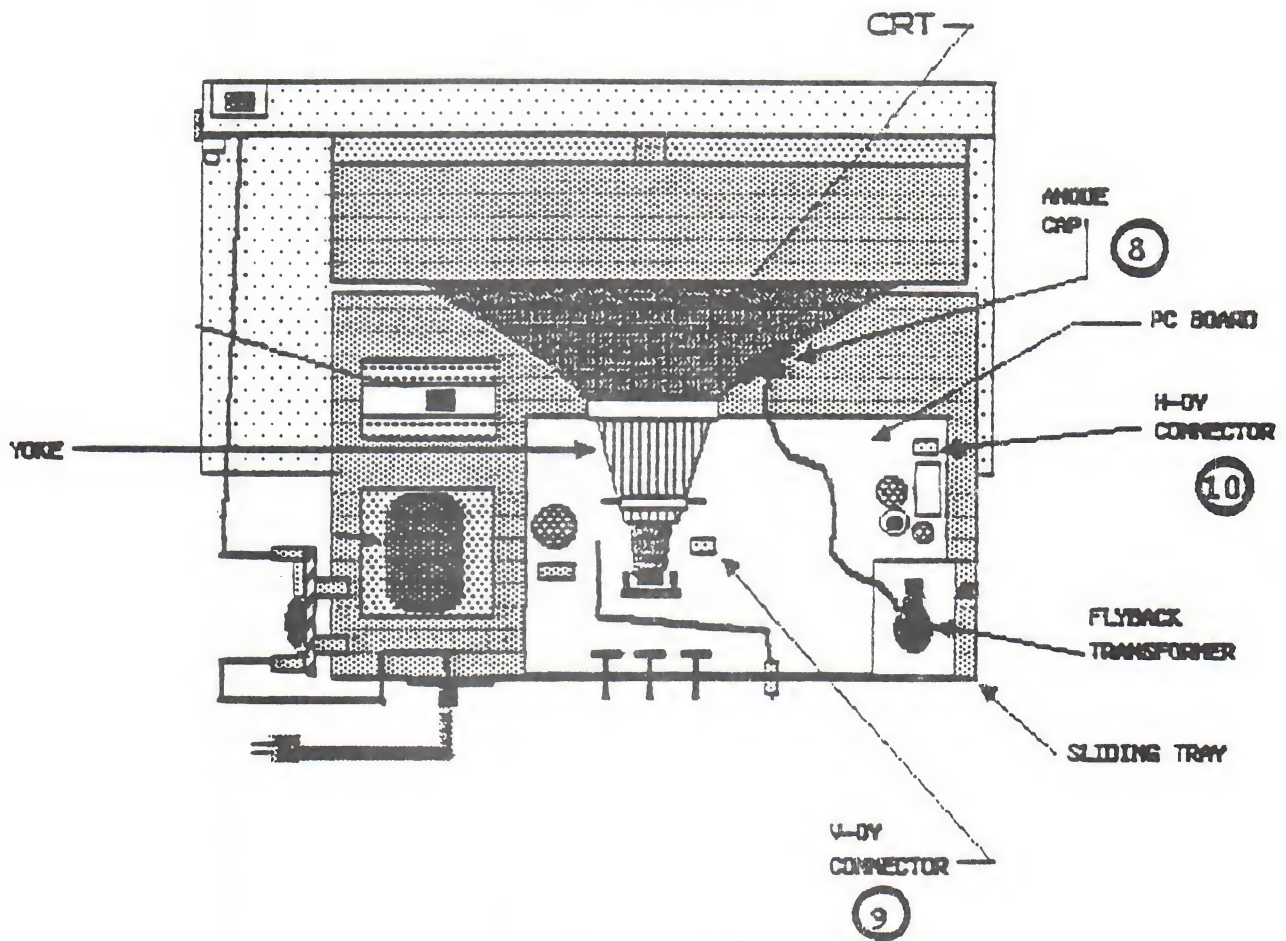


Figure 3





## CRT REMOVAL

### CAUTION

ALWAYS REMOVE POWER FROM THE MONITOR // AND DISCHARGE THE CRT ANODE BEFORE FOLLOWING THESE PROCEDURES. A STATIC CHARGE MAY STILL BE PRESENT ON THE HIGH VOLTAGE ANODE, EVEN AFTER POWER IS REMOVED. TO PROTECT YOURSELF FROM INJURY, ALWAYS DISCHARGE THE HIGH VOLTAGE ANODE BEFORE ATTEMPTING TO DISCONNECT IT FROM THE CRT.

1. Remove the back case (see Back Case Removal procedures).
2. DISCHARGE THE HIGH VOLTAGE ANODE. This is accomplished by connecting one clip of the jumper wire to the metal chassis and the other clip to the flatblade screwdriver. Then slide the screwdriver under the rubber cup (anode cap) on the side of the CRT until it contacts the metal clip (see Figure 3.8). The anode wire can now be removed by squeezing the clip on the end of the wire.
3. Remove the anode wire by peeling back the rubber cup, using long nose pliers to squeeze the metal clip together, and pulling it out.
4. Disconnect the two (2) pairs of wires going from the yoke to the PCB. The green/white is connected at V-DY in the center of the board (see Figure 3.9), and the brown/gray at H-DY located on the front right corner of the board (see Figure 3.10). Cut all the tie wraps along these wires.
5. Disconnect the socket on the end of the CRT.
6. Remove the black ground wire on the left side that runs from the PCB to the left side of the top ground shield.
7. Remove the five screws that hold the top ground shield to the front case, and remove the top shield.
8. Remove the two bottom mounting screws on the CRT (one at each corner).

Continued on next page





9. Support the CRT with one hand and remove the top CRT mounting screws. On the top right side there is an antistatic shield finger plate that will also come off. (Avoid touching the anode opening).
10. When all four mounting screws have been removed, gently lift out the CRT. If the CRT is hard to get out, hold the back end of the tube with one hand and gently push on the front of the tube with the other hand.
11. The yoke assembly can be removed from the CRT by loosening the clamp screw and sliding the yoke off to the rear. It may be necessary to cut through the adhesive at the front of the yoke.

### INSTALLING THE CRT

1. Insert the tube into the front frame, aligning the four mounting screws. Screw the top left hand mounting screw in first, and then the top right screw, making sure the antistatic shield finger plate is in place and touching the tube, and that the black ground wire from the right side of the PCB is also attached to the screw. Then put in the two bottom screws.
2. Reinstall the top ground shield that mounts to the front case with the 5 screws. Then attach the black ground wire coming from the left side of the PCB, to the left side of the top shield
3. Install the socket on the back of the CRT.
4. Connect the green/white wires from the yoke to the V-DY connector near the middle of the PCB, and the brown/gray to the connector near the front right corner of the PCB.
5. Reinstall the anode lead on the tube.
6. Tie wrap the wires that are in groups making sure that the chassis tray can slide all the way in and out without the wires binding.

**NOTE:** If the yoke had been removed or replaced an adjustment might be necessary. See the Yoke adjustment.

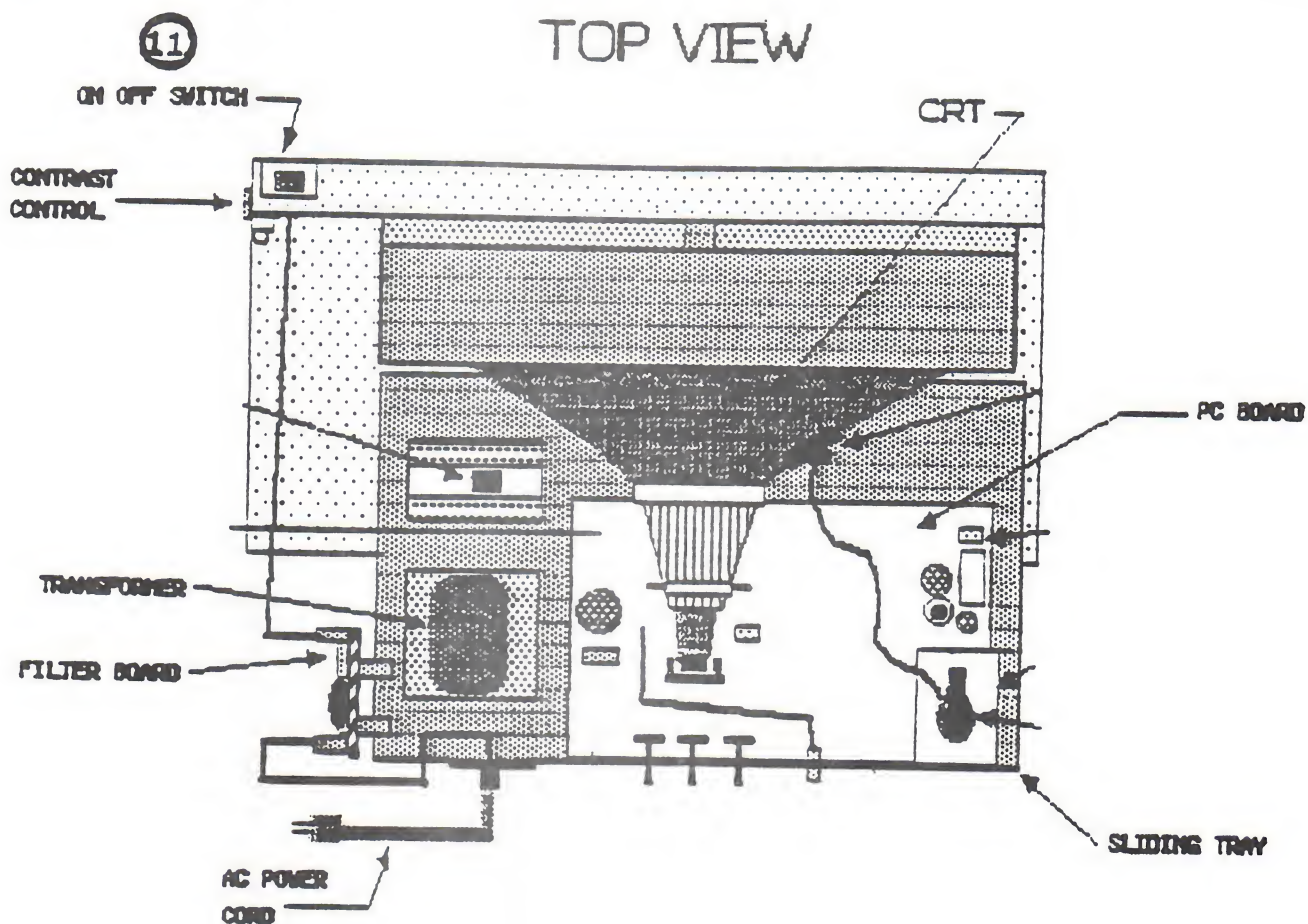


Figure 3

FILTER BOARD

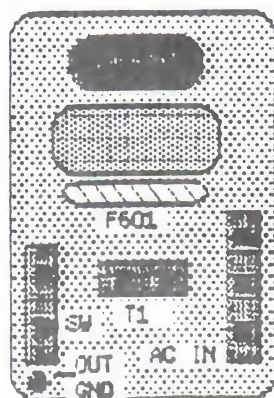


Figure 2





#### POWER SWITCH REMOVAL

1. Remove back case (see BACK CASE REMOVAL procedures).
2. Remove the two (2) screws that mount the switch (see Figure 3.11).
3. Cut the tie wrap on the switch, power cord and transformer wires.
4. Disconnect the switch leads from the filter PCB (see Figure 2).
5. To install the power switch, follow this procedure in reverse.



FILTER BOARD

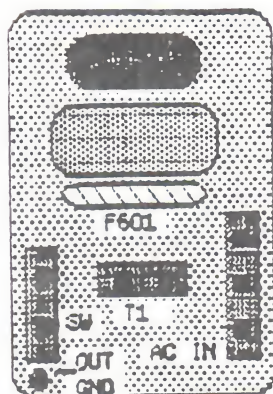


Figure 2

TOP VIEW

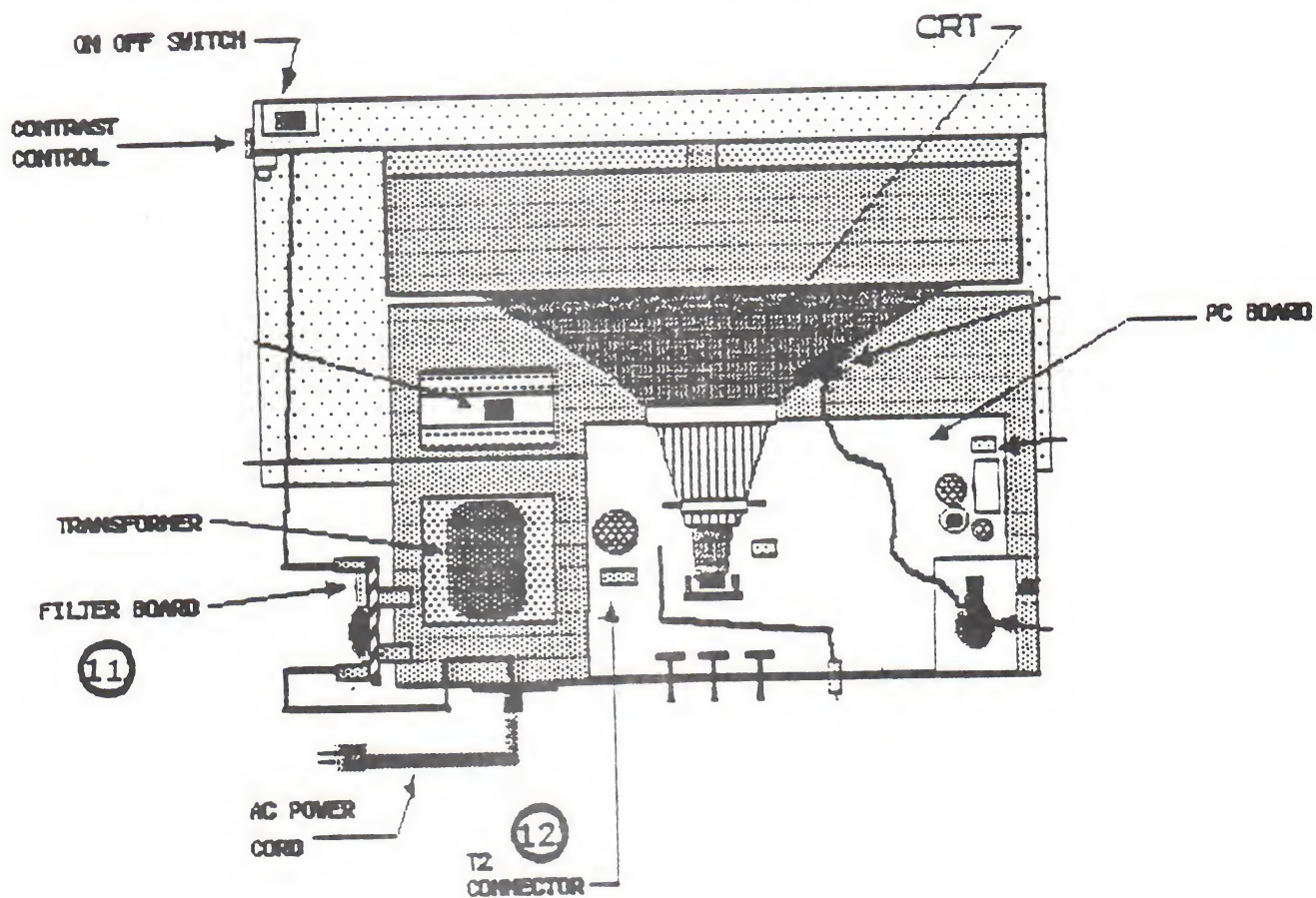


Figure 3



## TRANSFORMER REMOVAL

1. Remove back case (see Back Case Removal procedure).
2. Disconnect the black and white pair of wires at T1 on the filter board (see Figure 3. 11).
3. Disconnect the red pair of wires located at T2 on the rear edge of the main PCB (see Figure 3. 12).
4. Remove the two transformer mounting screws.
5. Remove the transformer from the Monitor.
6. Follow the above procedure in reverse to install the transformer.





## MONITOR // TECHNICAL PROCEDURES

### SECTION 3

#### ADJUSTMENT PROCEDURES

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## General Information

**NOTE:** Before using the Monitor Test Pattern Diskette, make a backup by using the program COPYA on the DOS 3.3 System Master diskette.

Using the adjustment procedures requires that test patterns be generated on the screen. For these procedures, use either the Monitor Test Pattern Diskette (part #686-0026) or the Apple //e Diagnostic ROM Card (part #661-94086) to generate these patterns. The ROM card can only be used with the Apple //e. It generates one pattern. The test diskette can generate three different patterns. The different patterns are used for the different adjustments.

One source of patterns is not necessarily better than the other. The only advantage of the test diskette is that it can be used with a greater number of systems.

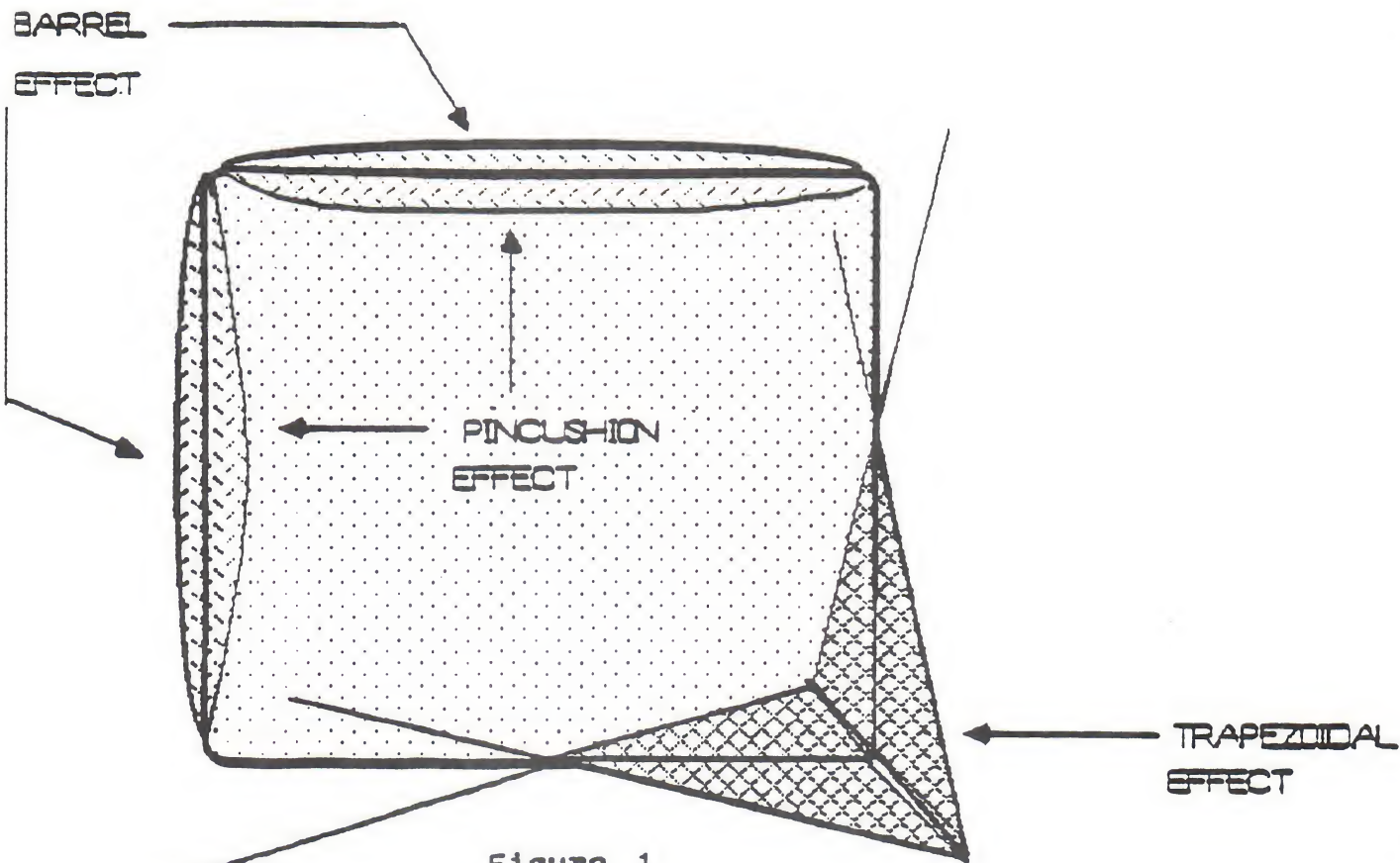


Figure 1

BACK SIDE VIEW OF TUBE

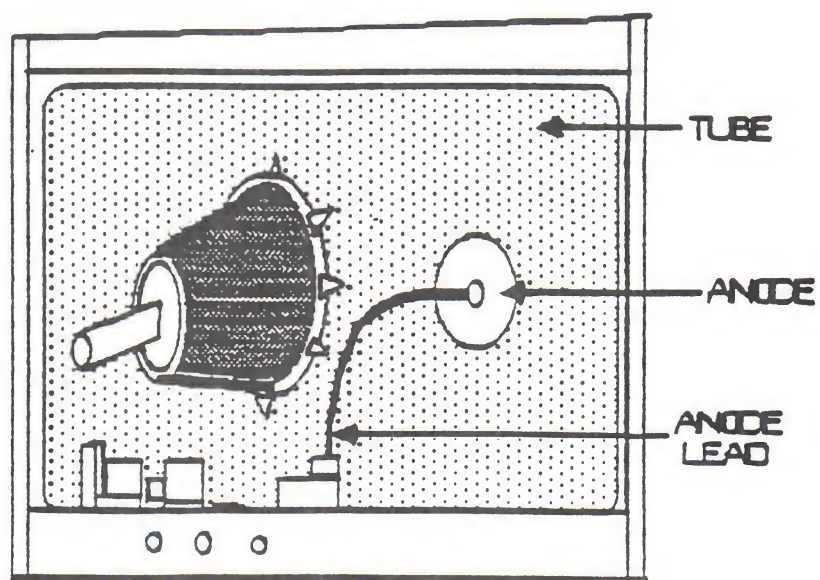


Figure 2



## YOKE ADJUSTMENTS

### INTRODUCTION

The following procedures are used to adjust the yoke assembly whenever the yoke or picture tube has been replaced. There are three major adjustments that might be needed, depending on if the picture is tilted, not centered, or if geometrically distorted. (By geometric distortion we mean barrel/pincushioning effect and the trapezoidal effect [see Figure 1] ). They are the tilt adjustment, the centering adjustment, and the geometric adjustment. It is possible all three adjustments might be needed or maybe none of them will have to be done.

### Materials needed:

Working Monitor //  
Apple ][ or //e  
Medium phillips screwdriver  
Flexible 12 inch ruler  
Monitor test diskette (part #686-0026) or //e Diagnostic ROM card (part #661-94086).  
Washable fine point marking pen

### CAUTION

THERE ARE EXTREMELY HIGH VOLTAGES ON THE TUBE, THE ANODE, AND THE ANODE LEAD. IN THESE ADJUSTMENTS YOU WILL BE PUTTING YOUR HAND NEAR THESE VOLTAGES. IT IS IMPERATIVE THAT YOU WATCH WHAT YOU ARE TOUCHING OR ADJUSTING ON THE YOKE ASSEMBLY; OTHERWISE INJURY CAN RESULT. AVOID TOUCHING THE TUBE, ANODE, AND ANODE LEAD (SEE FIG.2). NEVER HOLD ON TO THE CHASSIS WITH YOUR OTHER HAND WHILE MAKING THESE ADJUSTMENTS. PUT YOUR OTHER HAND IN YOUR POCKET OR BEHIND YOUR BACK WHILE MAKING THESE ADJUSTMENTS.

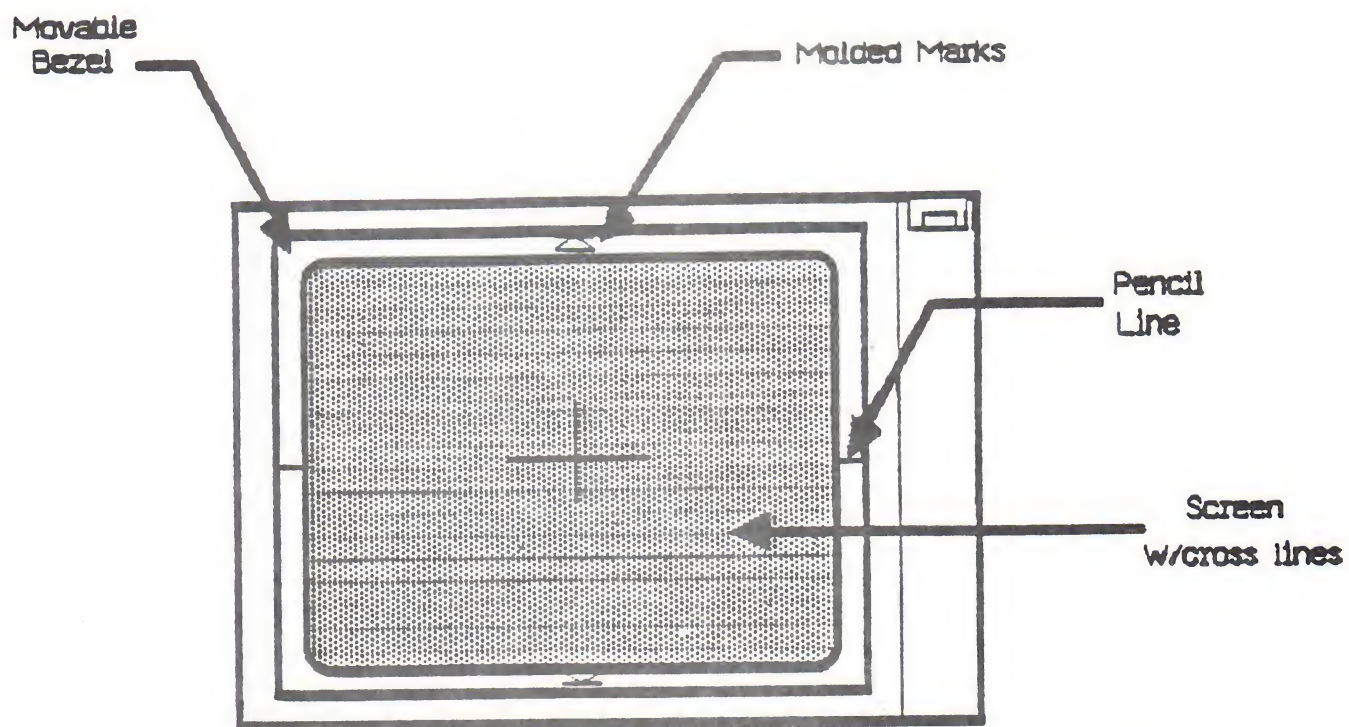


Figure 3





## SET UP PROCEDURE

1. In order to have some point of reference for centering the image it is necessary to mark the screen with the washable marker in the following manner:
  - a) Refer to figure 3 on opposite page.
  - b) On the edge of the bezel (thats the movable part that holds the tube and tilts up and down) measure from the top half way down (approximately  $4\frac{1}{4}$  inches) and make a pencil mark on each side of the bezel.
  - c) Take the flexible ruler and put each end of it on the marks on the bezel. Push the center of the ruler on the screen and make a line on the screen about 2 inches in what looks like the center of the screen.
  - d) Next find the two molded marking on the top and bottom of the bezel that look like diodes. This is the center of the screen for the vertical line.
  - e) Put the ruler ends on the center of the triangles and push the center of the ruler against the middle of the screen
  - f) Make a vertical line along the edge of the ruler; it should intersect with the horizontal line and will result in a cross line (+) on the screen.
2. Remove the Monitor // case (see Take-apart section).
3. Connect the video cable from the Monitor // to the Apple.
4. If you are using the test diskette, do the following:
  - a) Insert the diskette in the disk drive.
  - b) Power up the system.
  - c) Select "pattern 1" from the menu.
5. If you are using the //e diagnostic ROM card, do the following:
  - a) Insert the ROM card into slot 1 or 2 of the //e.

Continued on next page





b) Make sure the switch on the top of the card is pointing to the rear of the system.

c) Power up the system.

d) Select the Video Tests from the menu (V).

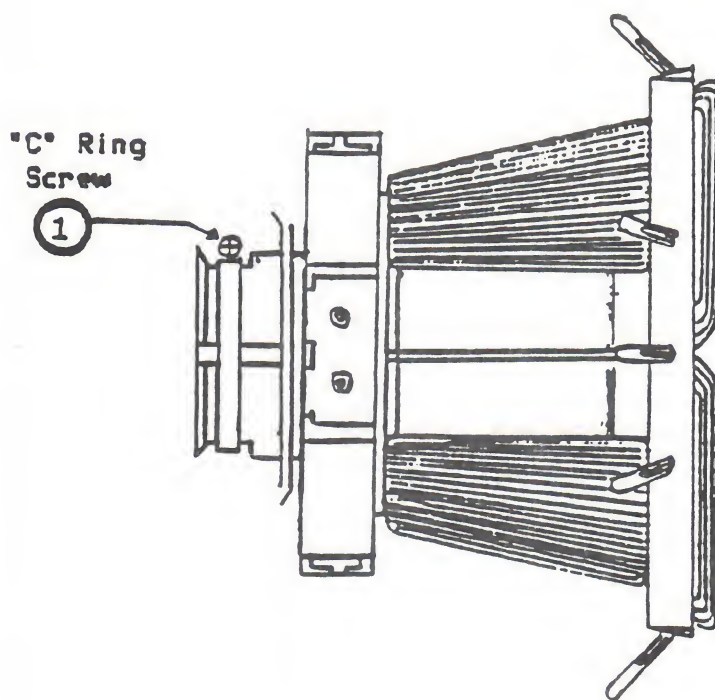
**Note:** If the menu does not appear when the power is turned on and the disk drive continues to whirl, the switch is in the wrong position. Shut off the system, change the switch and turn power on.

**NOTE:** There are two ways you can view the patterns and make the adjustments. One is to view the screen and reach around to the back to do the adjusting. The second way is to set up a mirror in front of the screen and view it from the back side while making the adjustments. If you use the reaching method, be sure you know what you are touching.

6. Determine if the pattern on the screen is tilted, centered incorrectly, or geometrically distorted; then proceed to the correct adjustment section as follows:

- |                          |                      |
|--------------------------|----------------------|
| a) Picture tilted:       | Tilt adjustment      |
| b) Picture not centered: | Ring adjustment      |
| c) Geometric distortion: | Geometric adjustment |

7. If you are not sure what adjustment is needed or if all of them look incorrect then do all three adjustments in sequence a, b, and c.



DEFLECTION YOKE ASS'Y

Figure 4





## TILT ADJUSTMENT

### CAUTION

**THERE ARE HIGH VOLTAGES ON THE YOKE ASSEMBLY; HANDLE ONLY THE PLASTIC PARTS OF THE YOKE. DO NOT TOUCH THE WIRES.**

1. If using the test diskette select "pattern 1" from the menu. If using the ROM card, select Video Pattern.
2. Locate the yoke on the stem of the picture tube (see Figure 4).
3. Locate and loosen the phillips screw that hold the C ring on the yoke. The screw is toward the back part of the yoke (see Figure 4.1 ). Do not remove the screw, just loosen it enough to make the yoke mobile.

Note: If the yoke is tacked to the tube with RTV glue, you will have to cut the glue before you can move the yoke. Power off the Monitor before attempting to make these cuts. Remember that the Anode of the tube retains a voltage potential that can shock you even though the power is off. Be extremely careful when doing this procedure.

4. When the yoke assembly is loose, turn it clockwise and counterclockwise and watch the whole picture tilt. Then gently move the assembly backward and forward on the stem and see how the whole raster can be made smaller or larger.
5. Push the yoke forward on the stem as far as it will go to obtain the largest raster possible. The ideal size raster would fill up most of the screen and just leave about a 1/2 inch boarder on all four sides. This might require doing the PC board height and width adjustment to get the proper size.
6. Adjust the yoke so that the image is level with the line you drew on the screen or with the top of the screen. If it is hard to tell if its level, hit CR and return back to the menu (if you are using the test diskette) and select "pattern 2", a grid pattern.
7. Retighten the C ring screw. Be careful not to overtighten as that could cause damage to the tube stem. Just tighten enough to be snug.
8. Tack the yoke to the Tube using some RTV glue.

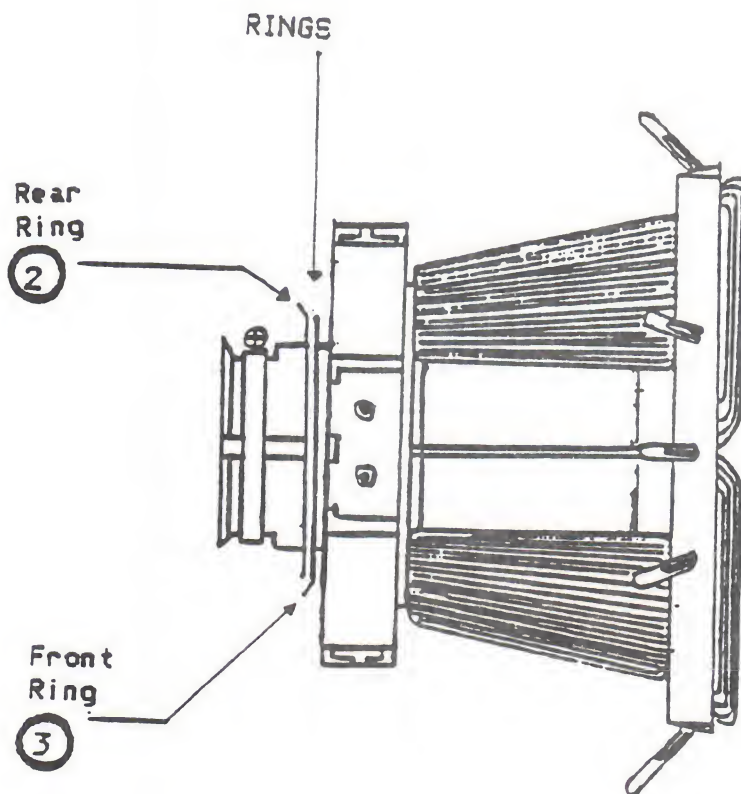


Figure 4



## RING ADJUSTMENT

This adjustment is made when the image is not centered.

1. If using the test diskette select "pattern 1" from the menu. If using the ROM card, select Video Pattern.
2. Locate the two ferrite metal ring magnets on the rear part of the yoke (see Figure 4).
3. The ring that is closest to the rear of the yoke (see Figure 4.2), is called the coarse adjustment. Rotate this ring and observe the effect it has on the centering of the image. Position it so that the image is as close to center as possible.
4. Now rotate the front ring (see Figure 4.3). This is the fine adjustment. Rotate it until the image is centered on the cross lines you put on the screen. It might be necessary to hold the rear ring steady as you move the front one.
5. The final result should be that the center of the pattern lines up with the cross lines on the screen.







## GEOMETRIC ADJUSTMENTS

There are two different geometric effects that can be seen on the screen. One is called pincushioning and barreling (see example Figure 5.1, and 5.2). The other is the trapezoidal effect (see Figure 7.1). Both are adjusted with the rotary magnets, however each one is done separately.

### Pincushion/Barrel Correction

If the image shows either effect shown in figure 5.1 or 5.2 then it will be necessary to correct it by doing the following:

1. If using the test diskette select "pattern 3" from the menu. If using the ROM card, select Video Pattern.
2. Push a magnet on the yoke mounting pin as shown in figure 5.3. A magnet should be placed only on the pin that corresponds to the affected area.
3. Rotate the magnet to obtain the desired raster, labeled "NORMAL" on figure 5.4.
4. If the desired raster cannot be obtained, add a second magnet to the yoke mounting pin. Both magnets must be aligned, as shown in figure 6 and then rotated simultaneously.
5. Adjust all the sides with magnets until they all line up correctly.

### Trapezoidal Adjustment

Figure 7 shows the trapezoidal effect. Look at your screen and see if any of the corners exhibit the trapezoidal effect. If any do, then perform the following adjustment:

1. If you are using the test diskette select "pattern 3" from the menu. If using the ROM card, select Video pattern.
2. Push a magnet onto the yoke mounting pin as shown in figure 7.2. The magnet should be placed only on the pin that corresponds to the affected area.
3. Rotate the magnet to obtain the desired raster, labeled "NORMAL" in figure 7.3.
4. If the desired raster cannot be obtained, add a second magnet to the pin. Both magnets must be aligned as in figure 7 then rotated simultaneously.
5. Do the adjustment until all the corners fit the "NORMAL" figure.



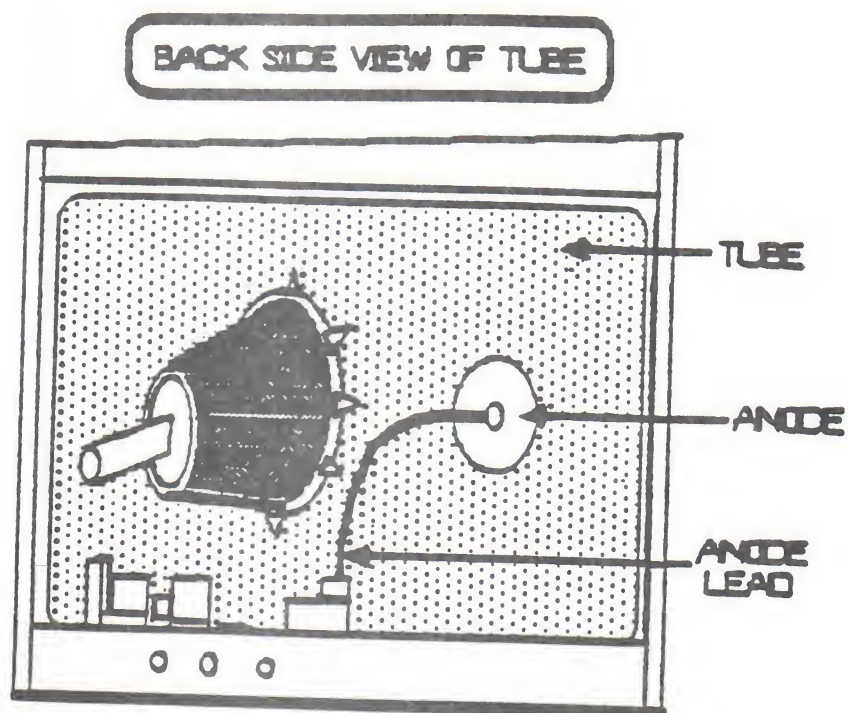


Figure 8



## PCB ADJUSTMENTS

### INTRODUCTION

After replacement of the PC board on the Monitor // the horizontal or vertical alignment may need adjustment. This procedure covers these adjustments. It is important that you read all the steps completely before beginning the adjustments, as several of them interact with each other; so if it looks like a step is not working, its possible that another step will correct the problem.

### Materials Needed:

Working Monitor //  
Apple ][ or //e  
Monitor test diskette (part #686-0026) or the Apple //e  
diagnostic ROM card (part # 661-94086).  
Plastic hex tip iron core adjustment tool (size 0.100)  
Plastic square tip coil adjustment tool (size 1/8" square)  
one manufacture is Spectrol  
Small plastic flatblade screwdriver (tweaker).

### CAUTION

YOU WILL BE WORKING WITH A LIVE HIGH VOLTAGE PICTURE TUBE. HIGH VOLTAGE IS PRESENT ON THE ANODE OF THE PICTURE TUBE, THE ANODE CAP, AND ANODE LEAD, (SEE FIG. 8). DO NOT TOUCH THE TUBE, ANODE CAP, OR ANODE LEAD, EXTREME SHOCK CAN OCCUR. DO NOT TOUCH OR HOLD ON TO THE CHASSIS WITH THE OTHER HAND KEEP IT BEHIND YOUR BACK OR IN YOUR POCKET WHEN MAKING THE ADJUSTMENTS.





## SET UP PROCEDURE

1. Remove the Monitor // case (see Take-apart section).
2. Connect the video cable from the Monitor to the Apple video out jack.
3. If you are using the test diskette, do the following:
  - a) Insert the diskette in the disk drive.
  - b) Power up the system.
  - c) Select "pattern 3" from the menu.
4. If you are using the //e diagnostic ROM card, do the following:
  - a) Insert the ROM card into slot 1 or 2 of the //e.
  - b) Make sure the switch on the top of the card is pointing to the rear of the system.
  - c) Power up the system.
  - d) Select the Video Tests from the menu (V).

**Note:** If the menu does not appear when the power is turned on and the disk drive continues to whirl, the switch is in the wrong position. Shut off the system, change the switch and turn power on.
5. View the screen and evaluate the vertical and horizontal alignment and linearity, determine which one needs correction and proceed to the correct adjustment. Remember that there is interaction between the two adjustment and you might have to do both to correct any problems.

Continued on next page







When evaluating the pattern do not use the characters or grid boxes in the corners as examples, use the middle of the rows. If the corners look incorrect even after adjustments have been made then it is possible there is a Yoke alignment problem and you should proceed to that section. Other guide lines to follow for evaluating the vertical and horizontal alignments are as follows:

Vertical:

Do the characters or grid boxes in the top and bottom rows have the same linearity?

Are the characters or grid boxes stretched out or compressed?

Is the picture rolling?

Is the image pushed more to the top or bottom?

Horizontal:

Is the linearity of the characters or grid boxes on both sides of the screen the same?

Is the width of the characters or boxes the same?

Is the picture tearing?

Is the picture rolling in a diagonal movement on the horizontal plane.

**NOTE:** There are two ways you can view the patterns and make the adjustments. One is to view the screen and reach around to the back to do the adjusting. The second way is to set up a mirror in front of the screen and view it from the back side while making the adjustments. If you use the reaching method, be sure you know what you are touching.

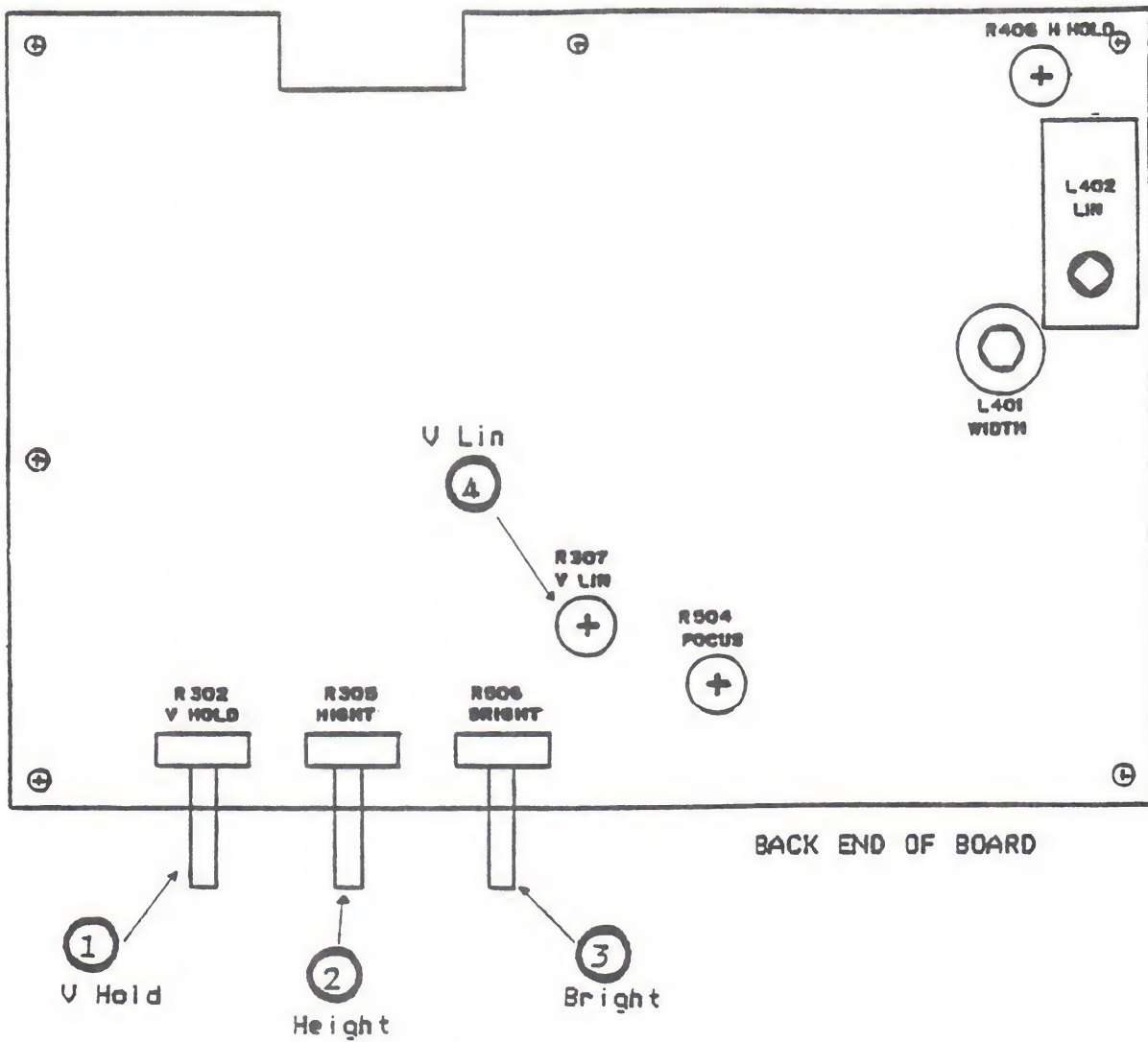


Figure 9



## VERTICAL ADJUSTMENTS

1. Set the vertical hold control R302 (see Figure 9.1) near the mechanical center of its rotation. This should lock the picture on the screen and prevent any rolling.
2. Linearity; If the vertical linearity is off, adjust R307 (see Figure 9.4) until the best linearity is found. Compare top and bottom characters or grid boxes and try to get them even. It is possible to reach the end of the adjustment range of the pot and find that the linearity is still not correct. That's because the height adjustment can affect the linearity. If this happens leave the pot at the end of its range and proceed to step 3.
3. Height: If the vertical height of the image is incorrect, then adjust R395 (see Figure 9.2) until the desired height is obtained. A good method is as follows:
  - a) Turn height control R305 counterclockwise to the end of the pot. The image will compress on the screen but still be legible.
  - b) Turn the brightness control R506 (see Figure 9.3) clockwise until you can see black edges at the top and bottom of the screen. If you don't see black edges on the top and bottom, turn the height pot R305 counterclockwise until the pattern is squeezed and the black area appears. If the pattern becomes blurred, then the brightness control is turned too far.
  - c) Adjust the height control R305 so that the black edges just disappear on the top and bottom of the screen. That will make the whole screen green in color and the characters or grid boxes just about the correct height. You can go a little further if you prefer larger characters.
  - d) Turn the brightness control R506 counterclockwise until the background on the screen goes black and the pattern is bright.
4. Re-evaluate the vertical linearity of the characters or boxes as adjusting the height can affect the linearity. If the linearity has changed, repeat step two (2) above. However once adjusted do not repeat step three and four again. Proceed to 5.

Continued on next page





5. If necessary readjust the vertical hold control R302 (Figure 9.1) until the picture locks (stops rolling) on the vertical sync.
6. Turn the Monitor off and on and see if the picture rolls. If it does then repeat steps 5 and 6 until it stops rolling.



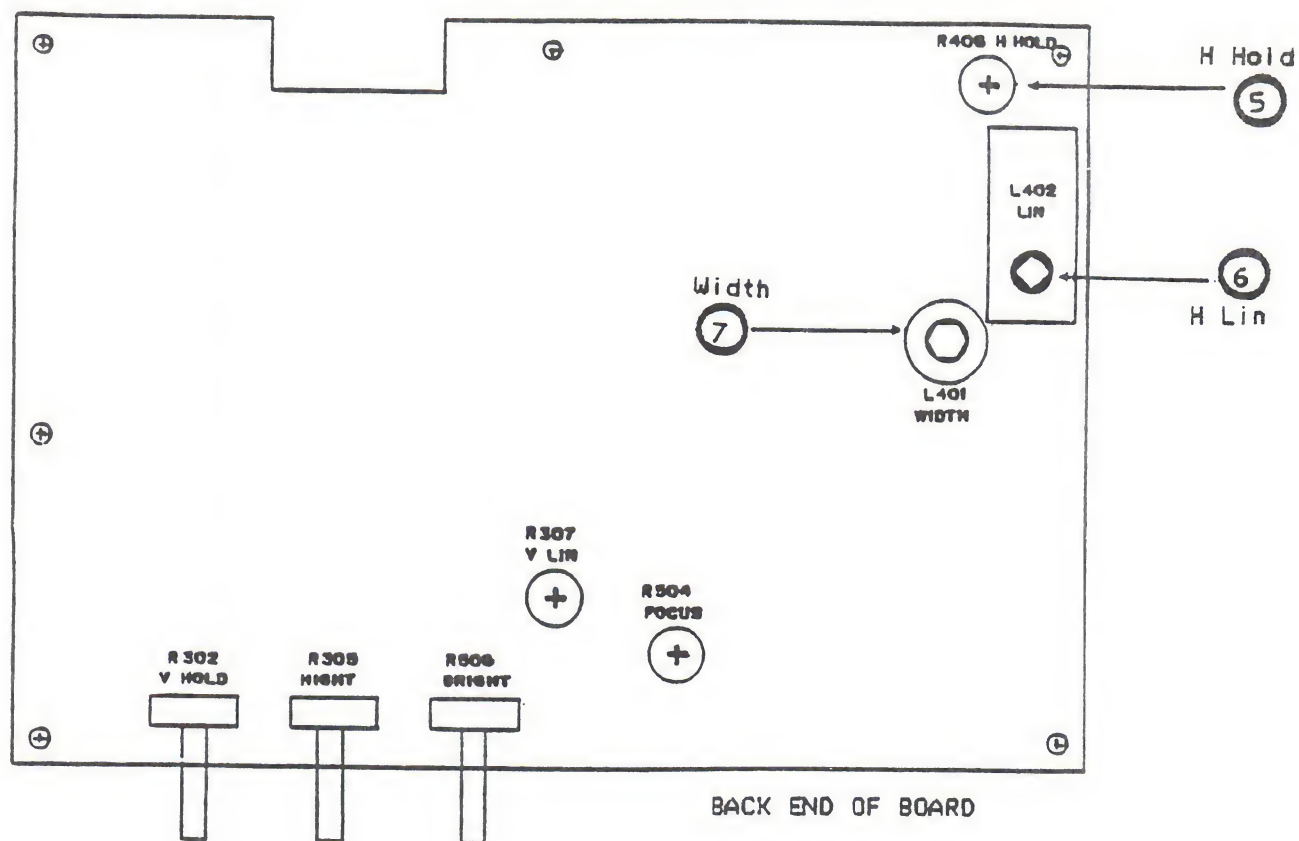


Figure 9

## HORIZONTAL ADJUSTMENTS

1. If the picture on the tube is not locked and centered, or if it is tearing, adjust pot R406 (see Figure 9.5). Be careful on this adjustment, as you will be physically close to the anode and anode lead in order to get to the pot.
2. If the raster will not lock in after adjusting the pot R406 to both ends, then it is possible there is a problem with the DC power supply.
3. Observe one row of characters or grid boxes and look for width variations on both sides of the screen. If they are all the same width through out the row then the linearity is O.K., proceed to step 5. If they are not, then adjust the linearity (step 4).
4. Linearity: In most units the coil L402 (see Figure 9.6) will be preadusted and sealed at the factory so you won't be able to change it. In this case proceed to step 5 and see if the width adjustment will help the linearity. If you do have a unit with an adjustable coil, use the square plastic adjustment tool and turn it until the linearity looks correct. If you have adjusted the coil as far as it will go and the linearity is still wrong, then proceed to the width adjustment, step 5.
5. Width: Check the width of the image on the screen. If it looks too narrow or too wide, then use the hex adjustment tool and adjust L401 (see Figure 9.7) until the desired width is obtained. The image should be an equal distance (approximately 1/2 inch) from each side of the screen, and yet not squeezed together. If the linearity is wrong on one side, this adjustment might correct it. It must be remembered that this is not a centering adjustment; don't squeeze the image just to get it centered.
6. If the unit has an adjustable linearity coil then see if the linearity has changed after step 5, if it has, then touch up L402 until the linearity is correct.
7. If all the adjustments have been made and the linearity is still incorrect then suspect a problem with the components on the PC board.





## MONITOR // TECHNICAL PROCEDURES

### SECTION 4

#### TROUBLESHOOTING

##### Contents:

Introduction.....	4.3
No raster.....	4.3
One horizontal raster line appears.....	4.3
One vertical raster line appears.....	4.3
Raster deformed abnormally.....	4.3
Abnormal raster with winding or excessive picture fluctuation.....	4.4
Spot remains with unit off.....	4.4
Brightness range abnormal.....	4.4
Raster size small picture abnormally bright.....	4.4
No vertical synchronization.....	4.4
Raster not centered.....	4.4
No picture/no contrast.....	4.4
Picture/characters inclined.....	4.4
Fine noises in picture characters shiver.....	4.5
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Picture appears/disappears.....	4.5
Horizontal linearity bad.....	4.5
Vertical linearity bad.....	4.5
Won't focus.....	4.5
Wavy display.....	4.6







## INTRODUCTION

This is the troubleshooting section. IT is comprised of a symptom chart showing the symptom, and an action to be taken to rectify the problem. The best way to use this section is to look on the chart to find the symptom that matches what the defective Monitor is doing, then try the recommended action to be taken.

### SYMPTOM

### ACTION

---

#### NO RASTER

Check fuse on filter board, replace if blown.

Check that all connectors are secure on the filter board and the PC board.

Replace Power Switch

Replace filter board.

Replace PC board

Replace Power Transformer

Replace Picture Tube

---

#### ONE HORIZONTAL RASTER LINE APPEARS

Replace PC board

Replace Yoke

---

#### ONE VERTICAL RASTER LINE APPEARS

Replace PC board

Replace Yoke

---

#### RASTER DEFORMED ABNORMALLY

Do Yoke Adjustment

Replace Yoke

---

Continued on next page



## SYMPTOM

## ACTION

---

ABNORMAL RASTER  
WITH WINDING OR  
EXCESSIVE PICTURE  
FLUCTUATION

Replace PC board

---

SPOT REMAINS  
WITH UNIT OFF

Replace PC board

---

BRIGHTNESS RANGE  
ABNORMAL

Replace PC board

Replace filter board

Replace Power Transformer

---

RASTER SIZE SMALL  
PICTURE ABNORMALLY  
BRIGHT (HIGH VOLTAGE  
ABNORMALLY HIGH)

Replace PC board

---

NO VERTICAL  
SYNCHRONIZATION

Replace PC board

---

RASTER NOT  
CENTERED

Turn Yoke centering  
magnets. See Yoke adjustment.

---

NO PICTURE  
NO CONTRAST

Replace PC board

---

PICTURE/  
CHARACTERS  
INCLINED

Turn deflection Yoke  
See Yoke adjustment

---

Continued on next page



## SYMPTOM

## ACTION

---

FINE NOISES IN  
PICTURE.  
CHARACTERS  
SHIVER

Replace PC board

---

15 OR MORE  
SECONDS FOR  
PICTURE TO  
APPEAR

Change CRT

---

PICTURE APPEARS  
DISAPPEARS

Replace PC board

Replace picture tube

---

HORIZONTAL  
LINEARITY BAD

Check horizontal adjustment  
See PC board adjustment

Replace PC board

---

VERTICAL  
LINEARITY BAD

Check vertical adjustment  
See PC board adjustment

---

WON'T FOCUS

Replace PC board

Replace picture tube

---

Continued on next page

## SYMPTOM

## ACTION

WAVY DISPLAY

Mounting screw on the heat sink is  
loose \*

\* If a Monitor // starts to exhibit a wavy display, it may be caused by the overheating of the voltage regulator (IC 601). The regulator is mounted on the heat sink near the power transformer.

If the failure occurs after the unit has had time to heat up, it indicates that the mounting screw that secures the voltage regulator to the heat sink is loose. This results in inadequate heat transfer between the two components.

If you must replace the voltage regulator, be sure to use thermal compound or an insulator pad between the voltage regulator and the heat sink.



## **Monitor II Technical Procedures**

### **Section 5**

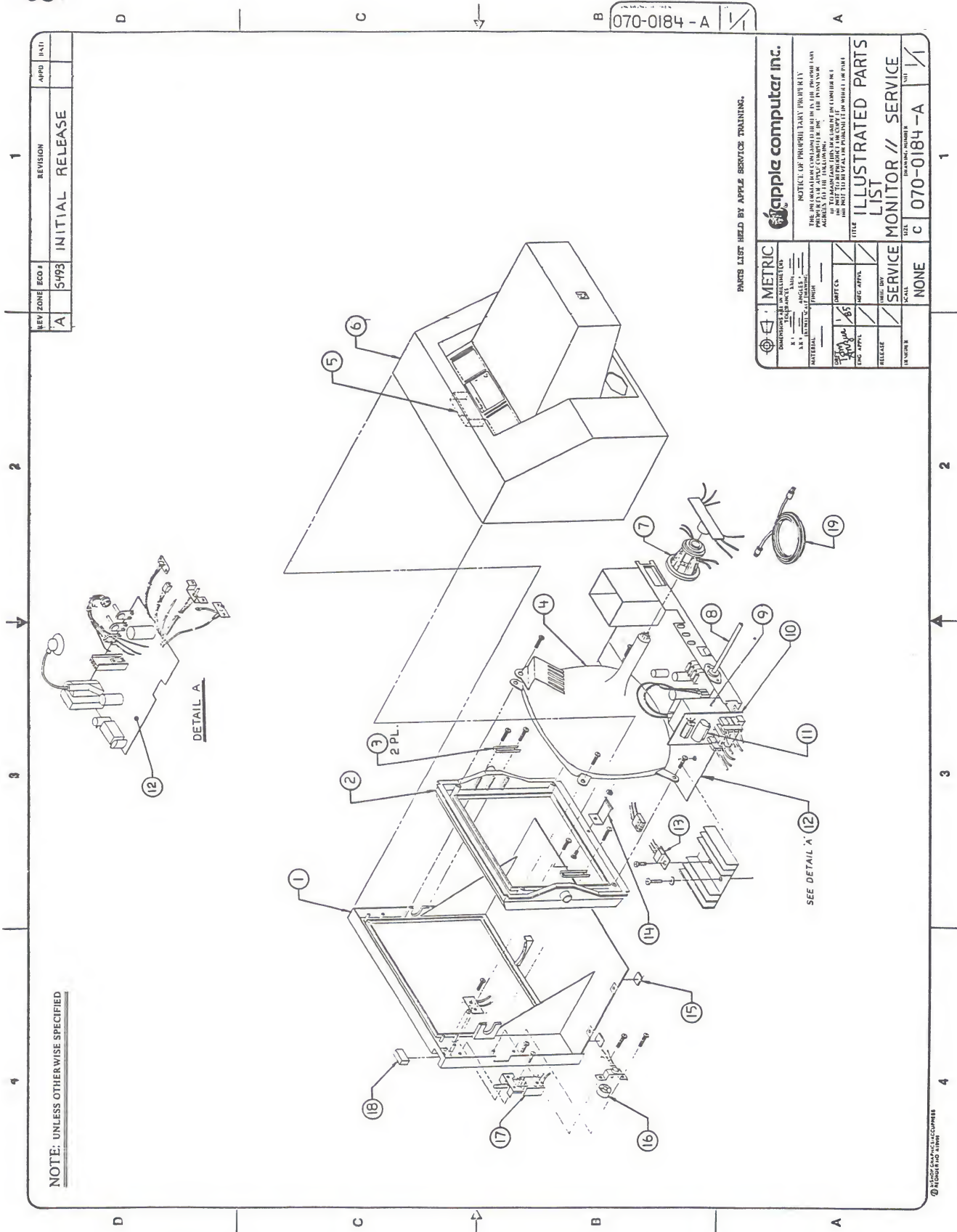
#### **Illustrated Parts List**

The figures and lists below include all piece parts that can be purchased separately from Apple for the Monitor II, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

#### **Contents:**

Illustrated Parts List.....	5.1
-----------------------------	-----





REV	ZONE	ECO #	REVISION	APPRO	DATE
A		5493	INITIAL RELEASE		

070-0184 - A

apple computer inc.

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ILLUSTRATED PARTS LIST

ITEM	DESCRIPTION	QTY	UNIT	REMARKS
1	MONITOR HOUSING	1	EA	
2	BEZEL	1	EA	
3	DISPLAY PANEL	1	EA	
4	VIDEO CARD	1	EA	
5	CABLE	1	EA	
6	CONNECTOR	1	EA	
7	CONNECTOR	1	EA	
8	CONNECTOR	1	EA	
9	CONNECTOR	1	EA	
10	CONNECTOR	1	EA	
11	CONNECTOR	1	EA	
12	CONNECTOR	1	EA	
13	CONNECTOR	1	EA	
14	CONNECTOR	1	EA	
15	CONNECTOR	1	EA	
16	CONNECTOR	1	EA	
17	CONNECTOR	1	EA	
18	CONNECTOR	1	EA	
19	CABLE	1	EA	

070-0184 - A



## Monitor II

Item	Part No.	Description
1	815-0779	Enclosure, Bezel
2	815-0780	Enclosure, Mask
3	805-0200	Plate, Pivot Retaining
4	076-0099	Monitor II CRT Module
5	815-0786	Filler, Handle Cavity
6	815-0778	Enclosure, Rear Housing
7	970-0453	Deflection Yoke
8	970-0629	Power Cord
9	970-0447	Power Transformer, 115V
10	669-0211	PCB, Line Filter
11	740-0106	Fuse, .5A, 250V, Quick Acting (Domestic, 110V only)
	740-0011	Fuse, .5A, 250V, Quick Acting, Pigtail (Domestic, 110V only)
	740-0200	Fuse, 1A, 250V, Slow Blow (Euro/Intl only)
	740-0070	Fuse, 1A, 250V, Slow Blow, Pigtail (Euro/Intl only)
12	661-75134	Main Electronics Assembly
13	353-7815	IC, 7815, 15V POS. Volt Reg. IC601
14	805-0202	Spring, Ratchet
15	865-0020	Foot, .81 IN SQ, .35 IN THK, Black
16	815-0781	Knob, Contrast
17	970-0445	Power Switch Assembly, 120V
18	815-0787	Knob, Power Switch
19	590-0025	Cable, Monitor II, /// Video

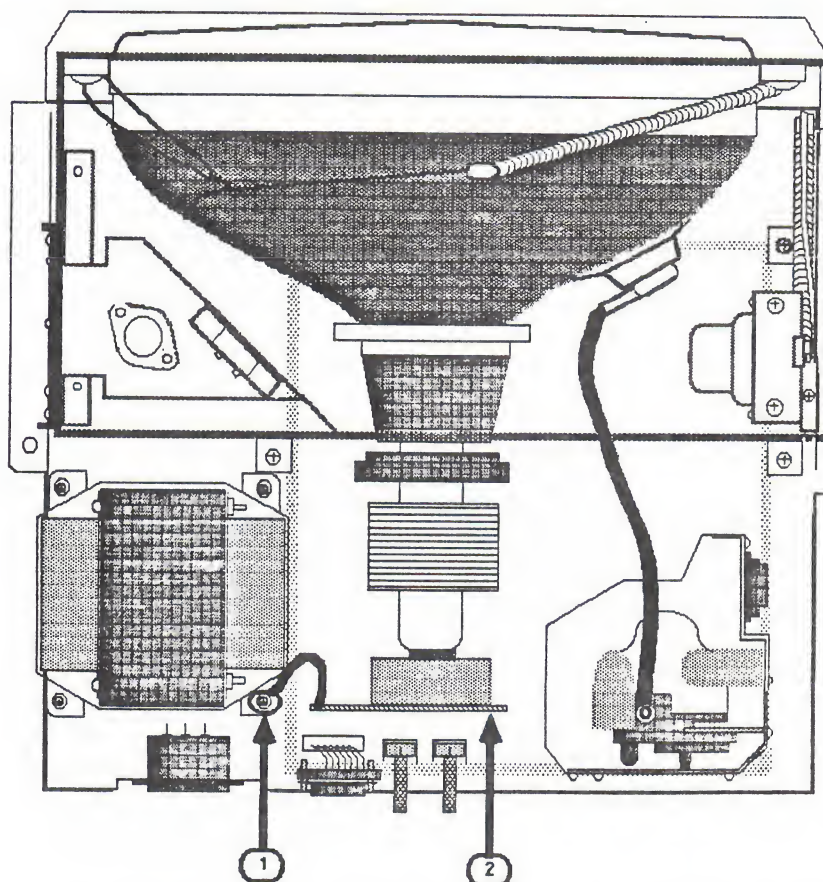


## Removing the Logic Board

**NOTE:** The CRT socket board, flyback transformer, and main logic board are all considered parts of one module since they cannot be separated from each other without desoldering components.

1. Disconnect the AC power cord.
2. Remove the rear enclosure.
3. Follow Steps 4 through 8 of "Discharging the CRT."
4. Remove the two Phillips screws (Figure 5, #1) which secure the DB-15 connector to the chassis. Disconnect the other end of the DB-15 cable from the logic board.
5. Disconnect the ground strap by removing the power transformer screw shown in Figure 6, #1.
6. Carefully pull the CRT socket board (Figure 6, #2) away from the CRT neck until it barely clears the neck base. Hold the board so that it does not fall free, and tilt it so that the component side is facing up.

FIGURE 6





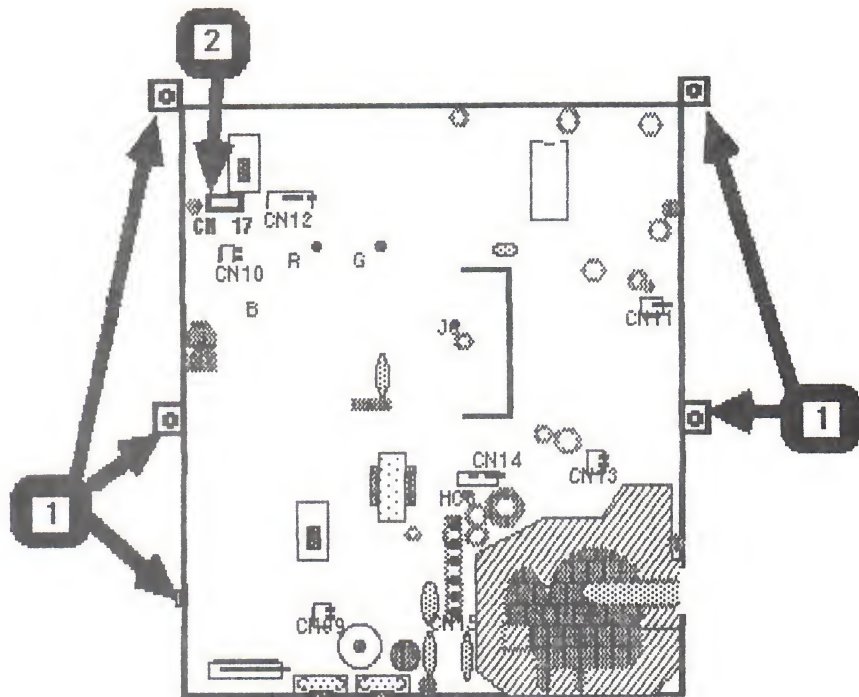


FIGURE 8

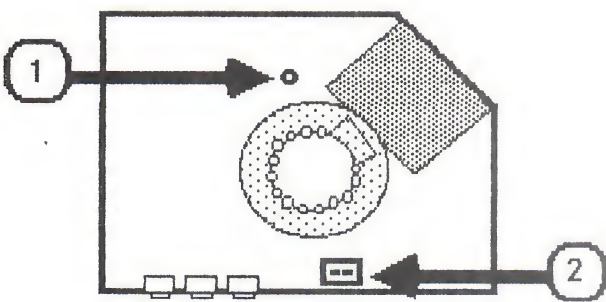


FIGURE 7

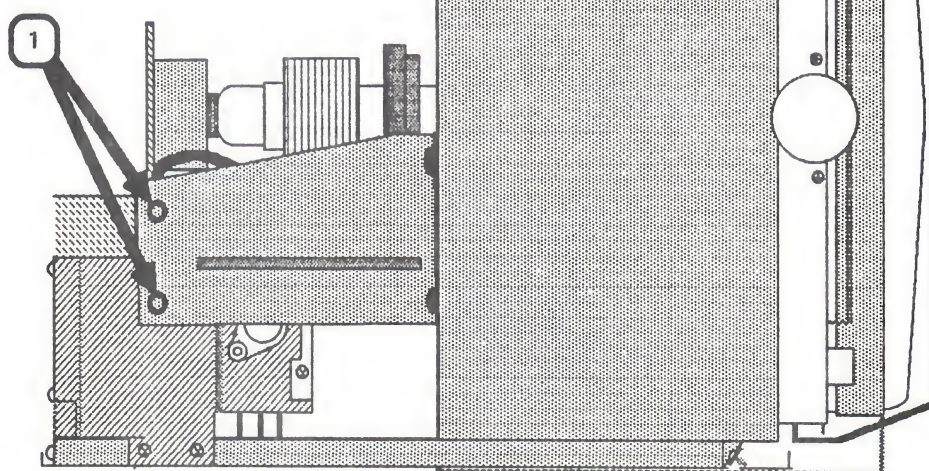


FIGURE 8A





**NOTE:** For those connectors with tabs, push in on the tabs before pulling the connector off. If connector 15 (CN 15 / logic brd) is difficult to remove, use a small, flatblade screwdriver to pry at both sides of the connector to loosen it before pulling it off.

**CAUTION:** DO NOT PULL ON THE WIRES ATTACHED TO THE CONNECTORS WHEN REMOVING THEM.

6. Disconnect the following connectors from the CRT socket board: (Figure 7.)
  - a) CN16 (black) -- Figure 7, #1
  - b) CN17 (blue and white) -- Figure 7, #2 (AppleColor Monitor 100 Rev. 0 only)

NOTE: On the AppleColor Monitor 100 Rev. A, CN17 is located on the logic board (Figure 8, #2) instead of on the CRT socket board.

7. Remove the five Phillips mounting screws (Figure 8, #1) from the metal plate which supports the logic board. For CRT Rev. A, also remove the two Phillips screws (Figure 8A, #1) securing the support bracket to the side of the flyback transformer.
8. Very carefully slide the logic board about halfway out of the chassis.

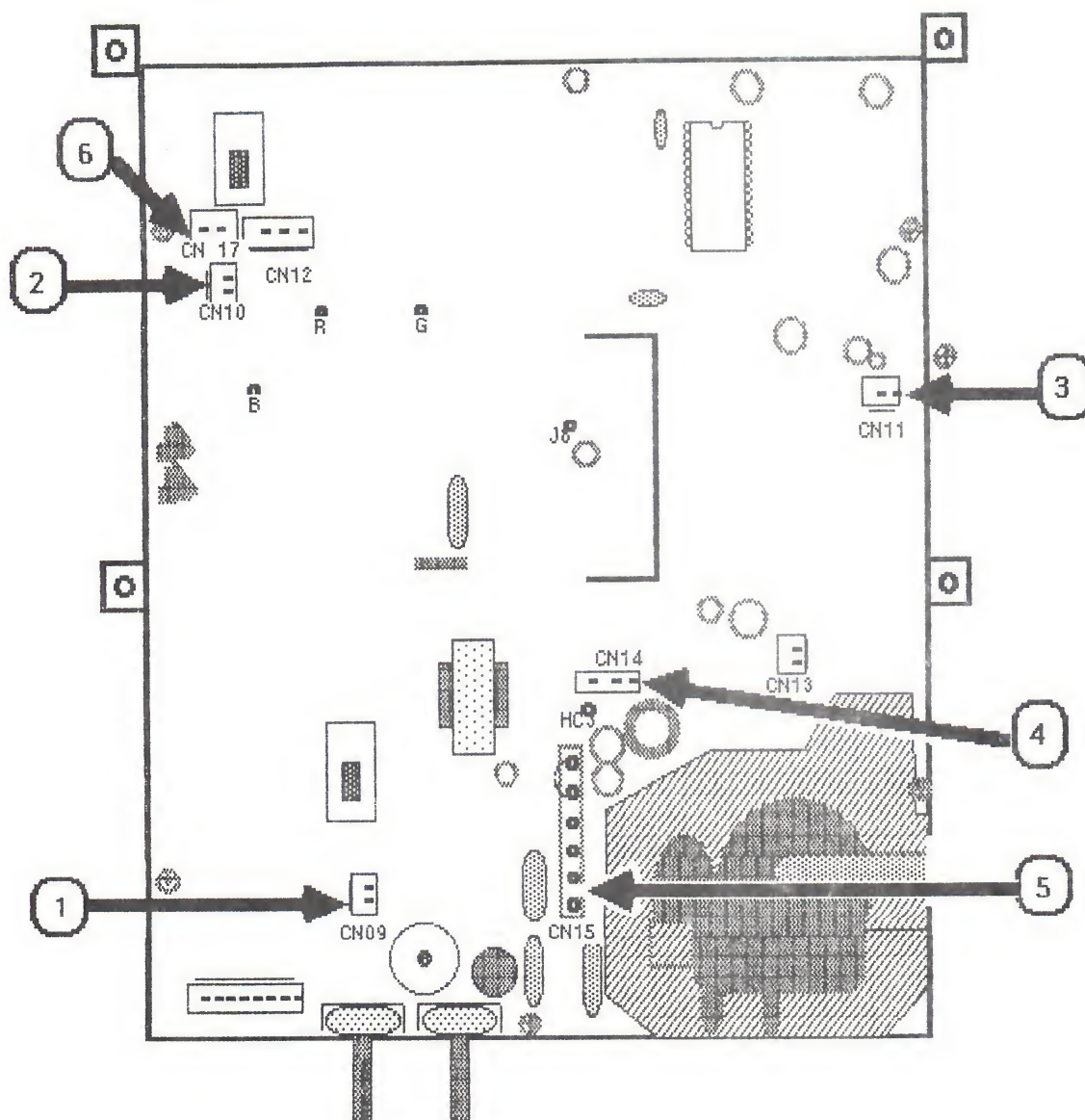


FIGURE 9